DOCUMENT RESUME

ED 144 137 CS 501 830

AUTHOR Pool, Ithiel de Sola; And Others
TITLE Refocusing Government-Communications Policy.
INSTITUTION Aspen Inst. for Humanistic Studies, Palo Alto, Calif. Program on Communications and Society.
PUB DATE 76
NOTE 74p.; Report of the Proceedings of Four Washington Staff Seminars on Communication Policy, Aspen Institute, Winter-Spring 1976
AVAILABLE FROM Aspen Institute for Humanistic Studies, Publishing Program Office, 360 Bryant Street, P.O. Box 1652, Palo Alto, California 94302 ($4.25 paper)

EDRS PRICE MF-$0.83 HC-$3.50 Plus Postage.
DESCRIPTORS *Administrative Policy; *Communications; *Government Role; Information Theory; Information Utilization; *Mass Media; *Media Research; Policy; Public Policy; Technology; *Telecommunication
IDENTIFIERS *Aspen Program on Communications and Society; Communication Research

ABSTRACT

In 1976, the Aspen Institute's Program on Communications and Society sponsored a series of Washington staff seminars on communications policy: "Policy Choices for the Information Age," "Government Telecommunications Research and Policy Development," "Problems of Regulating Specialized Telecommunications Common Carriers," and "Public Service Uses of New Communications Technologies." This booklet collects papers presented at these meetings and summarizes specific commentary and general discussion by seminar participants during the sessions. An appendix lists the names and affiliations of the program's participants. (KS)

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An Occasional Paper/The Aspen Institute for Humanistic Studies
Series on Communications

ED144137

# Refocusing Government Communications Policy

## Washington Seminars

### Policy Choices for the Information Age
Ithiel de Sola Pool
February 19, 1976

### Government Telecommunications Research and Policy Development
Martin C. J. Elton
March 29, 1976

### Problems of Regulating Specialized Telecommunications Common Carriers
Leland L. Johnson
May 10, 1976

### Public Service Uses of New Communications Technologies
John Witherspoon and
David Roessner
June 16, 1976

A Report of the Proceedings of
Four Washington Staff Seminars on Communications Policy,
Sponsored by the Aspen Institute in Winter-Spring 1976

Foreword by Roland S. Homet, Jr.
Prefaces and Summaries by Forrest P. Chisman

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CS501830

Aspen Institute for Humanistic Studies

**Library of Congress Cataloging in Publication Data**
**Main entry under title:**

**Library of Congress Cataloging in Publication Data**
Main entry under title:

Refocusing government communications policy.

(Series on communications) (An occasional paper—The Aspen Institute for Humanistic Studies)

CONTENTS: Washington seminars: Pool, I. de S. Policy choices for the information age: February 19, 1976. Elton, M. C. J. Government telecommunications research and policy development: March 29, 1976. Johnson, L. L. Problems of regulating specialized telecommunications common carriers: May 10, 1976. Witherspoon, J. and Roessner, D. Public service uses of new communications technologies: June 16, 1976.

**I.** Telecommunication—United States—Addresses, essays, lectures. I. Pool, Ithiel de Sola, 1917- II. Washington Staff Seminar on Communication Policy, 1976. III. Aspen Institute Program on Communications and Society. IV. Series. V. Series: Aspen Institute for Humanistic Studies. An occasional paper—The Aspen Institute for Humanistic Studies.

HE7781.R44 384'.0973 76-53767
ISBN 0-915436-35-3

**ASPEN INSTITUTE PROGRAM ON COMMUNICATIONS AND SOCIETY**

1785 Massachusetts Avenue, N.W.
Washington, D.C. 20036

Published in the United States of America in 1976
by the Aspen Institute for Humanistic Studies

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ISBN: 0-915436-35-3



Printed in the United States of America

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The Aspen Communications Program has operated since 1971 as one of several inter-related thought-leading-to-action programs of the Aspen Institute for Humanistic Studies. Its purpose is to identify major issues relating to the use and governance of the mass media and point-to-point communications systems, and to develop policies and actions dealing with those issues. In an era of accelerating technological change, the Program has judged it especially important to concentrate on the communications policy-making process as the mediator between new service opportunities and basic value structures in society. Workshops, seminars, and conferences are conducted on selected subjects within the Program's field of interest, and the results of these meetings and of research conducted and commissioned by the Program are published as The Aspen Series on Communications and Society.

A Program of the Aspen Institute for Humanistic Studies
1785 Massachusetts Avenue, N.W.
Washington, D.C. 20036 (202) 462-2011

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## FOREWORD

In 1976, the Aspen Institute's Program on Communications and Society sponsored two new projects, both conceived with a common objective by the Program's founding director, Douglass Cater. The first, the fruits of which are found in these papers, was the inauguration of a series of Washington Staff Seminars on Communications Policy under the able management of Forrest P. Chisman. The second was to establish as the major new thrust of the Program a three-year Project on Communications Policy Making. The chairmanship of this effort was assumed—after the expiration of his term as a Federal Communications Commissioner—by Glen O. Robinson. At the same time Mr. Cater passed direction of the over-all Communications Program to the writer of the present Foreword.

Underlying these innovations were three basic convictions:

- That communications policy is at a crossroads;
- That our society now faces major new choices ushered in by a specialized technology which both threatens and enhances some of our most fundamental values;
- That the mediating process by which policy choices are made should, accordingly, be exposed to widespread discussion and deliberation, in which humanistic considerations are given full play.

The basic governmental structure for national communications policy-making was established in 1934, when the technology for electronic communications was centered around wire transmission of point-to-point messages and radio-wave propagation of broadcast messages. As pointed out by Professor Ithiel de Sola Pool of MIT, in the lead paper of the Washington Staff Seminar series, the mix of electronic technologies and services has become infinitely more complex since that time, reflecting the emergence of an "information society" whose modes of communications delivery are increasingly converging upon each other and confounding the regulatory compartments established by the 1934 Communications Act. The challenge to public policy takes several forms: the imaginative regulation of new systems of communication under existing rules and standards; the forward-looking development of new and responsive communications policies; and the promotion, where appropriate, of public-service applications of the new technologies.

Each of the three other 1976 Washington Staff Seminars focused on one of these policy challenges. The second seminar, building on a report by the Subcommittee on Communications of the U.S. House of Representatives, examined alternative institutional structures for national policy research and development. Statements by four principal speakers were summarized by one of them, Martin C.J. Elton of the University of London's Communications Studies Group. The third seminar looked at the particular regulatory problems provoked by the introduction of competition for inter-city service between established telephone companies and the so-called "specialized common carriers." Leland Johnson of the Rand Corporation presented the principal paper. The final seminar in this initial series inquired into the terms and conditions for governmental promotion of social applications of new communications technologies, following recent experiments and efforts to disseminate health care and education by satellite and other means. Papers were presented by John Witherspoon of the Public Service Satellite Consortium and by David Roessner of the National Science Foundation.

In structuring the seminars and selecting the topics, the Aspen Communications Program was guided by a survey of needs expressed by leading government policymakers, by industry and public-interest representatives, and by impartial policy analysts. A major purpose of the seminars was to provide a forum where each of these groups could gather together in an informal setting and compare perspectives on current policy issues. The participants, whose names are collected in the appendix, found the dinner-table setting (at the Brookings Institution in Washington, D.C.) a congenial one in which to advance, test, and shape propositions about the most promising ways in which to enter the policy environment of the new "information society." The discussions

summarized in the papers that follow were lively, provocative, and productive.

In the coming months, the Aspen Institute's Project on Communications Policy Making hopes to schedule further Washington Staff Seminars as one of the instruments for appraising papers and proposals developed by that Project. As the following papers show, the initial series of seminars made a useful start in that direction.

Roland Homet
Director, Aspen Institute
Program on Communications and Society

# I.
# POLICY CHOICES FOR THE INFORMATION AGE

*by*

**Ithiel de Sola Pool**

Professor, Department of Political Science
Massachusetts Institute of Technology

**Commentary:**

*Lynn Ellis*—Director of Telecommunications, International Telephone and Telegraph Company

*Alfred Kahn*—Chairman, New York State Public Service Commission

*Edwin Parker*—Professor, Department of Communications, Stanford University

## PREFACE

This paper by Professor Ithiel de Sola Pool was presented at a seminar on communications policy conducted by the Aspen Institute's Program on Communications and Society on February 19, 1976, in Washington, D.C. After the presentation of the paper, there were comments by three panelists and a general discussion. The paper is reproduced here, together with summaries of the comments and the discussion.

Forrest Chisman
Associate Program Director,
Aspen Institute Program on
Communications and Society

## POLICY CHOICES FOR THE INFORMATION AGE

*by Ithiel de Sola Pool*

Four aspects of the technologies of communication in the last quarter of the twentieth century are likely to change society as much in that period as broadcasting did in the first half, or as printing did five centuries earlier. In the jargon of our field, those four characteristics of present developments are:

- the emergence of an information society
- the convergence of modes
- both the scarcity and the abundance of bandwidth
- the distance insensitivity of costs

### The Information Society

The significance of our emerging "information society" has been expounded most effectively by our colleague in this meeting, Marc Porat, and his co-author, Edwin Parker. They found that the information sector of the U.S. labor force has grown from 10 percent in 1900 to 27 percent in 1960, 48 percent in 1970, and a predicted 51 percent by 1980. The increase during the decade of the sixties was extraordinary; and while the rate has evened out since then, more people in this country now earn their living by manipulating symbols than by making or handling goods. For a million years of human history, only a tiny minority of mankind has professionally engaged in intellective activities. Such activities are now, at least in this country, the normal activity of the majority.

That fact has enormous social implications. One such implication, which Professor Parker is fond of stressing, is that an increased portion of our national product consists of what economists call public goods. Most goods are appropriated by individuals and are no longer available to other individuals. The person who appropriates the goods can be properly charged for their cost. When *public* goods are used, however, they remain available for use by others. Thus, when one person uses some knowledge, so can another.

This raises the question of who should bear the cost of the knowledge being used. The fact that there is no simple answer underlies the difficulties the Congress is having with the notion of copyright. Consider, for example, the difficulty of assessing what a CATV viewer or cablecaster should pay for enjoying the use of a TV broadcast.

A second possible implication of the information explosion is the fostering of a new form of social inequality or elitism. Natan Katzman[1] argues that whereas everybody in society will get more information as the information flow increases, the greater proportion of the increase will go to those who already have the most information. They have the resources of money, education, and skill which enable them to absorb more of the new flow. Thus, the gap will grow between the information-rich and the information-poor.

Quite frankly, I wonder whether this is true. It certainly is a possibility and represents a danger against which policy must fend. Yet, there are countervailing factors as well. Half of the age cohort in our society now begin a higher education. It is hard to believe that such a society will have a wider spread between the information-rich and the information-poor than one in which higher education was a rare privilege.

A third and equally controversial assertion about the information society is that it suffers inherent malaise and instability. Large numbers of young people, and indeed virtually all young people who come from the information-processing classes, are obliged, first, to go to school for many years beyond their biological maturity and then to accept the emotional discipline of paper-pushing jobs. It is certainly arguable that the information society makes intellectual and temperamental demands that are not congenial for a substantial proportion of humanity. It is less certain that those who find themselves in this bind are the ones most likely to protest and dissent in some way. Reactions of this sort undoubtedly do occur, but one may legitimately question the statistical importance of this problem.

Clearly, there are good reasons to be uncertain as to what the effects of the information society will really be. Yet, for better or worse, we are headed toward that kind of society, and we must begin to anticipate its impact. One thing that the society will certainly need is the best and most efficient job of education that we can provide, both for children and for the re-education of adults. As many people as possible must have the tools and the interests to function well in that society. The mass media—broadcasting, publishing, and the press—will also have a critical role to play in this process of determining the quality of life in the information society.

**Convergence of Modes**

The government, too, must play an important part in the successes and failures of the information society. Up to now, the government has followed a policy of keeping the media under its purview as separate as possible. For example, it has adopted rules to prevent theaters, television, and cable from offering the same movies at the same time. More important, AT&T and Western Union, which once fought for each other's turf, have been rigidly separated. Bell carries voice and Western Union carries telegrams. Bell was compelled to sell its TWX system to WU's Telex. But both Bell and WU now carry computer data on their lines, and the arrival of all-digital transmission will even abolish the difference between voice and data transmissions.

On advanced digital transmission systems to which phone systems are now moving, voice is no longer carried as an analogue signal but is sampled several thousand times a second, translated into digital bits, and transmitted in a flow that is physically indistinguishable from data. That fact has many implications, including the possibility of storing the spoken message in a computer for later transmission. Thus, the voice telegram will become a possibility. Why should the sender of a telegram from Cambridge to New York have to phone New Jersey, as he does today, to read his text to a clerk who then phones it to the New York addressee or transcribes it into the Western Union computer for transmission to a New York Western Union office to be mailed by post? The whole system is an anachronism and will be more so as it becomes technically possible for the sender to either type his message or to speak it over identical phone lines for temporary storage in a computer and retransmission to the receiver when convenient.

If Western Union is threatened by that development, so is the postal system. What will happen to the already troubled Postal Service, designated by the Constitution itself as a federal function, when its services collide with telegraphy and telephony? A Canadian Post Office study has estimated that already 45 percent of first-class mail starts in a computer (bills, etc.) and 20 percent ends up in a computer. It is becoming much too expensive to print out that data onto paper for handling by clerks. Thus, we are moving into an era where the separate existence of three major communications institutions is in question: the public institution of the Postal Service; the nation's largest private company, AT&T; and such specialized private carriers as Western Union. What will be their future form?

The convergence of modes is also observed in mass communication. In Britain, BBC is experimenting with Ceefax, a system for providing a written news display over the air to the TV screen, something cablecasters in the U.S. are doing over extra channels. Vendors of drama for pay are experimenting with CATV, cassettes, videodiscs, and over-the-air pay-TV—all of which are feasible alternatives.

The next major policy-relevant change taking place in communictions technology will be the growth of channels with adequate bandwidth to carry copious information to and from an audience. A number of technologies now make it feasible to receive and deliver individually addressed pictures, text, or voice over the same basic delivery system. We have the computers which control the data representations and flows, and the memories which store the information for shorter or longer periods. Now we need only the broadband channels. Both coaxial cables used for CATV and glass optical fibers (which in the coming decade will be an alternative to copper wires and coaxial cable) can provide such channels.

**Adequate Bandwidth**

Just as communications in print are constrained by column inches and pages, so the volume of electronic communication is limited by the bandwidth of the frequencies that are used. The situation is analogous to our energy crisis. The prospective exhaustion of one natural resource—the usable broadcast spectrum—has been an impetus for the development of new technologies for transmitting broadband signals. Yet, thus far, technology has only brought reprieves, and the day of reckoning remains. Scientists are finding substitutes for the scarce resource, but these substitutes have their price and their special problems.

In the United States, by law, the broadcast spectrum is a free good for which no price is charged. It is allocated by license to citizens who ask for it. There are now over a million transmitters on the citizen band and about a quarter million amateur broadcasters as well as radios in ships, airplanes, taxis, trucks, and police cars. There are microwave phone circuits and transmissions to and from satellites. All of this is in addition to broadcasting and to the half of the spectrum which has been preempted by the government, mostly for national security use.

The exhaustion of the spectrum by these conflicting claims on a free good has been postponed, partly because science has learned how to squeeze more stations into the same space without interference. (Note the OTP's recent proposal to squeeze 200 more VHF stations onto the American air, the so-called "VHF drop-in.") More important, we have learned to use shorter and shorter waves. For example, radio broadcasting was originally transmitted in the 300 to 3000 Kc medium-wave band. During the 1930s, FM radio and television were assigned to the shorter-wave 30 to 300 Mc VHF band. Now, additional television is provided in the 300 to 3000 Mc UHF band along with microwave, which was developed during the war. Most telephone long-line circuits today are carried by microwave rather than cable.

Satellite transmissions are putting a new demand on the spectrum. A satellite floating 22,300 miles above the equator covers one-third of the earth's surface with its signals, or if the beam is narrowed, an area of roughly 1,300 miles across. Thus, a satellite must transmit via a wave length that is not in use in terrestrial transmission in the reception area. If the satellite transmission is to be direct to small, low-cost television receivers, the signal must be especially strong, with much bandwidth. The only place on the spectrum where such signals could be placed is *above* the presently used frequencies—for example, at 14 and 16 GHz. Present TV sets are not built for those frequencies, and, therefore, direct satellite transmissions are not yet possible.

New technologies may alow the use of higher and higher frequencies, but there is still a limit to such expansion, particularly as the higher frequencies are less efficient and economical. It is like drilling in poorer and poorer oil fields. Sooner or later, some users will have to be pushed off the free air waves onto the expensive transmission medium of coaxial cables or optical fibers.[2] Moving off the airwaves has a remarkable advantage, along with the disadvantage of higher costs. With coaxial cable, and even more with optical fibers, it becomes possible to transmit a volume of information (that is, greater bandwidth) that could never be available over the air. It is practical, for example, to transmit 35 TV channels over a single cable. Thus, instead of a limit of say, four TV stations in an average city, an unlimited number of channels becomes technically possible—what the Sloan Commission called the television of abundance.

Despite its advantages, cable may fail to become a universal transmission medium in the United States. (About 14 percent of TV sets in the U.S. are now on cable, and the number grows only a point or two a year.) The reason is in large part the unfriendly regulation by the government. Another factor is the reluctance of citizens to pay a few dollars a month to upgrade a service that, heretofore, they could get free over the air. There is also the prospective competition of optical fibers. This new technology may turn out to do everything coaxial cable can do and do it better and cheaper.

Whether by optical fibers or coaxial cable or microwave, or by some combination of the three, the American home or office of the 1990s will be reached not merely by a few radio and television signals plus a telephone wire carrying a voice signal, but by a wide electronic highway capable of carrying many two-way signals simultaneously, be they monitors, or voice, or TV, or facsimile, or data. The public policy implications of this development will be major.

For one thing, there is the pace at which the changes should take place. The FCC and the existing media tend to protect the large investments in present communication systems against sudden obsolescence by new technologies. The $70 billion phone company plans some of its investments for a 40-year life. Countries without our great investment in communications plants may well leapfrog us. Japan is moving ahead faster on direct satellite broadcasting, for example, and Canada is way ahead on CATV. Iran is thinking about having *two* domestic satellites to optimize its phone and broadcast services.

The problems are not only America's slowness of action. There are also dangers in change. With a fiber-optic phone system, for example, TV could be transmitted to the home along with phone calls, and the telephone monopoly that the FCC has kept so rigidly out of the broadcast business would become the obviously efficient carrier for all communications. Cable systems would be out of business. The question is whether the regulators and the courts will try to hold back progress in broadband communication services in order to protect the present structure of separate industries.

**Distance Insensitivity of Costs**

By the phrase "distance insensitivity of costs," communicators describe the situation in which it costs no more to send a message a long way than a short way. For example, at night, it now costs little more to call California from New York than to call Chicago—one-third the distance. There are various technological reasons why declining costs in communication have mostly been in long-haul transmission. One is the geometry of satellite transmission. A message sent by satellite from point A to point B on the earth's surface travels 22,300 miles up and 22,300 miles down. It makes virtually no difference whether the two points on the surface of the earth are 500 or 5,000 miles apart, so long as they are in the footprint of the same satellite. Thus, distance ceases to be a factor in calculating the cost of such communication.

The same trend toward reduced long-distance transmission costs is observable in terrestrial communication, too. There are advances in coaxial cable and the even more dramatic prospects of such devices as optical waveguides. Costs are also falling in microwave transmission and in undersea cables. Thus, even without the advent of the satellite, long-distance transmission costs are becoming a minor portion of the total bill.

**Policy Consequences of These Four Characteristics**

A great physicist once said to me, after going through the arithmetic of the number of stars and planets contained in the universe, that there must be at least several hundred of them with life. The mystery, he said, is not whether there is life elsewhere in the universe; but given that there must be, why has no civilization communicated with us? By any statistical process of chance, there would be a number of life systems that would be several millennia more advanced in evolution than man. Perhaps, I replied jokingly, they are sufficiently advanced not to want to communicate with us. No, he answered, progress depends so critically on communication that it is inconceivable that a species could win in the struggle for survival without maximizing its development of communication.

Without trying to resolve this cosmic issue, I would like to take my physicist friend's viewpoint at least to the point of arguing that what the new communications technologies make possible will, in fact, be done. The competitive advantages of having abundant information and of abolishing the barriers of distance are so great, that societies which fail to take full advantage of them will wane, and those that use them will survive. In the end, then, the new technologies will be with us.

If technology is in the driver's seat, and we are now entering an information age, what are the policy consequences that we can foresee? To try to answer this question, I recently went through a short brainstorming exercise at MIT. For three quarters of an hour, we tried to list the important communications policy issues of the present and near future. We did not apply any selectivity. The list was simply one intuitive set of judgments. We came up with 52 issues, grouped these into related clusters, and then regrouped the clusters. Let me review the main themes that emerged from the discussion:

***Social effects.*** Among the many social effects of modern communications, one may note some profound changes in the urban and regional distribution of business, social, and political activities. Thus, one policy issue is how to make investment in communications contribute to a desirable territorial organization of such activities.

To illustrate the point, we may look at the history of the telephone. Before the telephone, businesses of several kinds would locate in a city neighborhood, side by side, so that when one needed information or to do business, one could simply walk down the block or drop in at the corner coffee house. With the arrival of the telephone, a business could consolidate into one plant and/or move to cheaper quarters. Thus, the telephone contributed both to the skyscraper and to urban sprawl. Continued improvement of telecommunications today may also be contributing to the erosion of the urban downtowns. On-line computing, facsimile, and improved telephony are making it less and less important for major business institutions to be downtown or even in an urban area.

In some countries, such as France and England, communications policy is being used to facilitate the moving of people and activities out of the central city and into the provinces and new towns. In many developing countries, on the other hand, the central government feels so vulnerable to regional separatism that no broadcasting is allowed except from the national capital. Such a policy strengthens nationalism but risks atrophy at the local government level.

In the United States, there is much ambivalence about communications policy. There are advocates of a new rural society, and there are advocates of keeping and improving the present urban system.

Certainly, the U.S. broadcasting system is now predicated upon the desirability of localism. It is a principle for which we pay a considerable price in spectrum, in the number of broadcasting stations available to the average viewer, and in our inability to meet the needs of geographically distributed minorities. On the other hand, the principle is important in providing a base for the civic culture by strengthening communities.

There is a parallel between these issues and some international ones. On a global scale, the issue centers on control within the sovereign unit versus openness to inputs from outside that unit. This issue affects a number of communication forms that we have already noted: direct satellite broadcasting, international computer networks, satellite "parking spaces," and cable in border areas. Those who would close their borders talk about cultural imperialism, data sanctuaries, and foreign ownership of important national media. Those who wish to communicate freely point to the inefficiencies that result from autarchic telecommunications manufacturing, to the opportunities for technical cooperation via telecommunications, and to the human right to know and to communicate. These issues come to a head mainly around satellites and spectrum uses.

***Maintaining culture and free speech.*** The second large category of communications issues concerns the support of culture and of freedom of discourse. A critical issue in every country is how to pay for material of cultural merit. Neither advertisers nor the mass audience will provide the funds that make possible works of great merit. In some form or another, a combination of affluent private customers plus government grants and privileges must provide such support.

In the United States, the issue of government support for public broadcasting has reached a provisional resolution recently. Similar issues are being raised, however, by those who wish to have satellite service available for education. The argument is made that the market for educational materials is available, but there is no way to aggregate it without public action.

Copyright, one governmental device for supporting culture, is becoming another increasingly thorny issue. No legislation that the Congress enacts will solve the issue; for it is complicated by the very nature of the converging technologies of modern communication. In the Gutenberg era, the obvious point of control over communication was the printing press. Censors operate on that fulcrum, as does the system designed to compensate authors. No one has tried to collect a royalty from the resale of books through thousands of book stalls; it would be impossible. Nor has anyone tried to impose a royalty on public readings from a book, or lending a book to a friend, or assigning it in a classroom. The royalty is imposed at the one point at which there is easy control and a fairly reliable count of the numbers. For the same reasons, copyright has not been applied until the last few years on speeches or singing or acting or painting. The basic law of copyright in the Anglo-American tradition required that there be the production of a physical, legible text.

Modern communications technology is eliminating this point of control. Xerography results in the widely distributed production of individual copies. Computer storage permits retrieval onto CRTs or other computer memories or onto hard copy—and at any location where there is a terminal. It is clearly important to reward those who create intellectual products. Some scheme for encouraging them has to be found. But it is naive to believe that it can be done simply by extending a scheme that grew out of one technology.

Closely related are the issues of freedom of speech and of privacy. In this country, we have a curiously trifurcated regime. Under the Constitution, we have a system of print media which are more or less totally unregulated. We also have a system of broadcasting which we regulate closely, mainly in order to assure diversity of views and controversy. Finally, we have a system of regulated common carriers. The increasing convergence among these historically separate forms of industry means that few communications firms will remain in the unregulated domain long and that services in the regu-

lated and unregulated domains will be competing with each other. If our forefathers were correct in believing that government regulation would, in the end, endanger a free press, then these developments are quite ominous.

There are alternatives, of course. The Whitehead Cable report recommended a return to the print model of nonregulation in the electronic domain. If spectrum shortage were not a problem, it would in principle be possible to do this. It is far from clear, however, that this is in fact the direction of movement in national policy at the present time. On the contrary, to protect existing broadcasting institutions, we have government regulations which tell cablecasters (who do not use a scarce medium and, therefore, presumably should have the full protection of the First Amendment) that they may not play movies made between two and ten years ago or import programs from particular locations. It is conceivable that if a political movement wished to put out its message in the form of a five-year-old movie, or wished to carry a rally from a distant city to its followers elsewhere, the Supreme Court could find it within the right of the government to interfere in any way. I personally find it hard to reconcile such regulations with the United States Constitution. Yet they exist and they prevail, at least for the moment.

There are other strong pressures toward increased government controls of communications content. There is concern about the effect of violent TV programming on children. There is concern about the broadside way in which leaked government confidences are published. There is concern about the intrusions on individual privacy by media pandering to sensation. The eternal conflict between protection of the freedom of the communicator and protection of other values continues and always will.

Many believe that computer technology has made privacy particularly vulnerable. Manual files are much more easily violated than computerized ones, of course; but the results of computer rifling are apt to be more complete and accurate. Violations of privacy in the computer age may be less common, but they are also more threatening than they have been in the past. How to control those violations without infringing the freedom of enquiry of an investigator is a great dilemma.

***Management of innovation.*** A third group of policy issues is those concerning progress in communications innovations. With massive investments at stake, the strong vested interests inevitably mobilize to prevent rapid obsolescence by innovation. Broadcasters attempt to block CATV or pay-TV. Post offices illegalize mailbox services on time-sharing systems.

The government regulators themselves become part of this protective system, since they are reluctant to preside over the destruction of the industries that they were set up to regulate. Yet government also has a responsibility to promote progress. It is supposed to prevent monopolies from standing in the way of change. It also provides much of the funding for research and development of the new technologies, both in the defense program and in the space program.

There are real difficulties in knowing how to organize research and development for communications, and also how to make the resulting technical information available to political decision-makers. The structure of research and development varies greatly in different parts of the communications industry. The telephone monopoly has a superb laboratory. The postal monopoly does no significant research and becomes more and more technologically obsolete. The competitive broadcasting and publishing industries do modest amounts of serious research but on the whole can be described as technologically backward. The competitive computer industry is a hotbed of technological change. None of these have a social science counterpart to Bell Labs, at least none in this country. (In Japan, the phone company supports a Research Institute for Telecommunications and Economics.)

Policy decisions need to rest upon an understanding of the new communication technologies, yet the decisions must normally be made by individuals who have a very limited grasp of the technology.

In some other countries, where the communications organizations are relatively self-contained bureaucracies, the engineers and specialists may be at the top. The problem there is providing the general public with access to allow their complaints and desires to be heard. In the United States, the situation is generally the reverse. The adversary process allows political and economic interests to be heard, but provides no input for independent expert analysis. Neither extreme is satisfactory, but to wed those two approaches is not easy.

Who, for example, is going to do the difficult trade-off analysis between, on the one hand, a system of high-powered satellites, which would allow the use of many low-cost ground stations but require more spacing on the orbit, and, on the other hand, a system of low-powered satellites, which serve only to distribute among expensive national or regional ground stations. The quantitative trade-offs in such an analysis cannot be well-developed in an adversary proceeding. We must begin to find ways to get better technological evaluations into the hands both of users in education, medicine, and social services, and of government policy-makers.

***The structure of the industry.*** Finally, we must note an important set of recurrent issues about the structure of the industry. Should it be monopolistic or competitive, public or private? How can the regulators avoid becoming captive of the regulated, or if not captive, how can they be prevented from making regulation an end in itself? What should be the structure of the regulatory institutions: How should they be related to the legislative branch, the executive, the users, the industry? There are also issues about the vertical and horizontal integration of the industry, and about pricing. Should pricing be based on value of service or cost? What about cream-skimming and cross-subsidization? What are appropriate methods of accounting and allocation of joint costs and of amortization?

A related set of issues concerns control of the flow of communications. In many countries, labor unions are trying to exercise a voice on what the media say and how they operate in the society. Editors fight with publishers for control of the content. Where cross-ownership or chains exist, the various federated units struggle for their autonomy. Where the medium is a carrier for messages produced by others, there is a struggle between the customer trying to keep the carrier in a passive common-carrier role and the carrier trying to use its monopolistic leverage to extend its activities. Abroad, a number of PTT's have moved into computing services.

Yet another set of issues concerns methods of payment. Who should pay: government, advertisers, customers? Where payment is linked to services received, how can we measure the value of information? What is the value of one use of the spectrum rather than another? How does one compare demands for fixed services, mobile services, broadcasting? Finally, what are the social utilities of having communication? How important is it for society to link the last remote rural resident? What is the social value of media time devoted to public affairs?

In the coming decades, the most dynamic sector of our economy is likely to be communications services. While the growth of other sectors is limited by resource constraints, the flow of symbols can continue to add to the improvement of human life. There are resource constraints for communication as well, such as those for newsprint and copper and spectrum, but technological solutions will permit increasing processing of information at relatively low resource use. In the information society into which we are moving, knowledge and communication are among the few commodities that citizens of the whole world can be given more of without exacerbating the terrible resource constraints caused by growing populations and rising expectations.

## COMMENTARY

After the presentation of Professor Pool's paper, comments were offered by the three panelists. Dr. Ellis spoke on selected characteristics of new communications technologies and also on the conditions for technological innovation. He pointed out that much communications hardware is misunderstood, in the sense that it is either underestimated or overestimated. With regard to the former, he pointed out that the conventional telephone network already has a capacity for broadband distribution of information and, in certain circumstances, for low-cost, two-way transmission of such information. Cable television, he said, has more abundant bandwidth, but it is most appropriate for communications from one source to many receivers.

Satellites, on the other hand, are often overestimated. Their distance insensitivity is not appropriate for all distances, and their high level of initial cost compares unfavorably with other communications modes, especially when distances are less than 1,000 miles. Dr. Ellis offered the proposition that the cost of signal transmission on an optimum system varies with the square root of the distance to be covered.

Dr. Ellis also commented on the convergence of communications technologies, and, in particular, the digitalization of the telephone network. He noted that this development makes it increasingly difficult to distinguish between data transmission and other forms of sending electronic messages, and that there is increasingly little reason to think that the processing of data needs to be restricted to central exchanges. Finally, Dr. Ellis said that he believes the development of new technologies in the United States is currently proceeding at a healthy pace, particularly where the profit incentive is still present. The federal government's role in research and development can be constructive if federal projects can show that the utility of new systems justifies their price. In this case, the entrepreneurial instinct is likely to take over in the private sector. The most difficult policy decision for government is to cease or avoid interventions in areas where innovation has proved to be self-managing or socially constructive.

Professor Parker directed his remarks to the social factors conditioning and conditioned by the growth of new communications technologies. He began by saying that new technologies tend to influence the form of social institutions, which tend, in turn, to influence policy decisions. He argued that it is primarily during times of technological change that institutions are flexible enough to allow major policy departures.

Professor Parker then went on to report that recent Stanford research has indicated that the United States has moved into an information system in which over 50 percent of the labor force is involved in symbol manipulation of one sort or another. This means that the future of information industries is not only vitally important to the national economy, but also instrumental in increasing productivity throughout the economy. We can no longer afford to be inefficient in producing communications media.

Professor Parker cautioned that the free market will not necessarily result in the efficient allocation of resources to information production. There are equilibria for both under- and over-investments in information. In addition, he pointed out that the free market is not necessarily an optimal way of allocating information resources, because information is not easily appropriable. Transferring information from one individual to another does not take it away from the first individual. As a result, information is not easily dealt with as a commodity. Nevertheless, Professor Parker believes that there are reasons to be optimistic about the role of information in our economy. At a time when energy resources are being depleted, there is still a possibility for economic growth in the information sector. Information can become the key transforming resource in our new economy.

Professor Parker then turned to electronic fund-transfer systems, which he regards as a case study of the communications infrastructure. He pointed out that EFTS includes five components: (1) a basic communications service; (2) value-added data service; (3) financial-transaction facilities; (4) storage and manipulation of data; and (5) terminals. Optimally such a complex system should not be used only for EFTS. Rather, an effort should be made to find proper interconnect and terminal-attachment policies to develop a comprehensive advanced telecommunications facility for the future.

Dr. Kahn addressed the economic problems of telecommunications regulation, concentrating primarily on pricing and conditions of competition in the telephone industry. He said that most state regulators are hostile to competition because it upsets the complex and, in his view, indefensible pricing structure of monopolistic industries. In a monopoly sector, the relationship of prices to cost can be very loose, leading to such practices as "value of service" pricing and the setting of rates with a view to such social goals as the universal provision of telephone service. However, state regulators resist usage-sensitive pricing and keep depreciation rates artificially low. This affects the ability of innovative services or services enjoying rapid technological advances—telephone long-line facilities, for example—to compete optimally in the market place. Dr. Kahn also criticized jurisdictional separations procedures which artificially skew the pricing of interstate and intrastate telephone service by loading too large a portion of cost on interstate service.

Dr. Kahn said that there are three major lessons to be learned about competition in the telephone industry. The first is that the telephone is now virtually universal and, consequently, the historic divergence of prices from costs may no longer be justified. Alternatively, if there is a continuing need for subsidies to some classes of service, this should be done through something like the Rural Electrification Administration.

Second, there is no reason not to price telephone service in terms of usage. More properly, he said, service should be priced in terms of whether it creates some incremental cost (nonusage of service, when it incurs cost, should also be reflected in the price). For example, whenever it is necessary to provide backup capacity for a telephone system, prices should reflect the cost of that capacity, whether it is used or not.

Third, the major prerequisite for advancing the application of new technologies is the reduction of prices to long-range incremental cost as quickly as possible. Dr. Kahn rejected the logic, derived from the Supreme Court decision in *Smith* v. *Illinois,* that common usage of the telephone plant by interstate and intrastate services should result in loading a large part of the intrastate costs onto the interstate prices. He said that interstate costs are already discriminated against because of flat-rate local pricing.

Dr. Kahn concluded by saying that it is impossible to ignore the case for some natural monopolies, for preserving the integrity of the telephone network, and for institutions such as Bell Labs. He nevertheless endorsed the notion of freedom of competition and freedom of entry in selected portions of the communications field, and he warned against the danger of regulatory cartelization as a response to new technologies and competition. Finally, he urged that the right to compete in the communications field should also and prominently include the right of the Bell System to compete.

## GENERAL DISCUSSION

Discussion at the meeting centered on two major problems. The first, springing from Dr. Kahn's remarks, was how to overcome the difficulties in having AT&T compete on an equal basis with new entrants in communications markets. The second was the general problem of when and for what reasons communications industries should be regulated.

Discussion of the first issue arose when Dr. Kahn was asked how to handle the problem of cross-subsidies if AT&T is allowed to be fully competitive. The questioner also suggested that if AT&T were allowed to compete in all fields for which it has a capacity, it might easily dominate such industries as cable television but, at the same time, refrain for reasons of self-interest from developing these industries to their full potential. Dr. Kahn replied that there are significant problems in determining cross-subsidies, but that it was wrong to be so concerned about them that regulation results in the worse evil of cartelization.

Another questioner suggested that allowing free reign to AT&T might result in the unacceptable political and social consequence of having too much power concentrated in one entity. It was generally conceded that the proper regulation of AT&T could only be determined by trading-off economic and social values and that it is difficult to find a ready formula for doing this. In addition, it was pointed out that judgments about this trade-off may tend to fluctuate, thereby creating instability in the industry.

A compromise solution was that AT&T should be allowed to compete, not in its present form but as a "carrier's carrier," which would limit its activities to wholesaling transmission capacity to other communications industries. It was pointed out that the communications industry is already evolving in this direction with the development of networks which own no communications facilities at all. On the other hand, there are social and economic problems in an industry, such as cable television, which provides carriage for hire and also provides programming.

The discussion of when and why to regulate arose from the suggestion of one participant that, because of the importance of communications in the information society, government should ensure access to communications facilities on an equal basis for everyone, and that common carriage should be a dominant or presumptive mode of operation. Several participants objected that common-carrier status should be granted only selectively, and only when it was considered necessary to enforce non-discriminatory access and rate regulation. One participant pointed out that common carriage is in fact a very restrictive concept, which often gives each carrier a "fenced-in territory" and can easily lead to cartelization.

From the question of when to establish common-carrier status, the discussion moved to general principles underlying regulation. Some participants believed that regulation should be aimed at achieving definite social goals, such as ensuring that the communications system will contribute optimally to the gross national product and generally to social welfare. It was suggested that regulators should provide incentives to bring the interests of industry into line with social values. In particular, some participants said that more cooperation between communications firms in sharing information and in interconnection should be encouraged through regulation, government purchasing power, and tax incentives. It was argued that information may no longer be a "zero-sum game," and that competitive processes may not yield optimal social results.

Many participants objected to this view, saying that they doubted whether regulators and other government officials could have the information necessary to create proper incentives and that the power to create such incentives is extremely diffuse within the federal government. In their view, regulation should be invoked only when it is clear that an industry in a free-market environment would bring about social or economic harm. The goal of regulation should always be to increase the realm of freedom in the society and economy; and regulators pursuing broad social goals, such as access, might find that these goals require excessive coercion. Many participants felt that regulation can also be harmful because regulators, in the absence of information, may wish to avoid complexity in their decision-making by foreclosing options.

The discussion then turned to whether broad communications functions, such as data transmission

and public message exchange (as distinct from particular technologies), should be regulated. On the one side, it was argued that unless regulation was aimed at functions, a crazy-quilt structure of rules would result. On the other side, some participants insisted that regulation should be considered fundamentally abnormal. Print communication should be considered the norm, and regulation of communications employing other technologies should be deployed only in response to peculiar market- or freedom-constrictive tendencies inherent in those technologies. In this view, the technology is the proper focus of regulation.

Others pointed out that a case could be made for supervising even some aspects of the press media, if the goal of the First Amendment is to expand the market place of ideas. In fact, they noted that the Newspaper Preservation Act and the undistributed-profits tax already exert considerable control over print journalism. The discussion of when and why to regulate ended with the observation that most regulators cannot look very far into the future and that, while the ultimate goal of something like a single national fiber-optics dissemination system might be clear, it can only be reached after a step-by-step evolution.

## FOOTNOTES FOR CHAPTER I

1 "The Impact of Communication Technology: Promises and Prospects," *Journal of Communication,* Autumn 1974, pp. 47-58.

2 The idea of using optical fibers for communication began to be developed in England around 1968, and telephone companies are already starting to experiment with the fibers for trunking between switching centers. The hairlike filaments carry substantially more bandwidth than a heavy coaxial cable. However, there are still unresolved problems with the system. For instance, we do not yet know how to build efficient switches for transmission channels contained in the beam of light running down the glass filament. Thus, it will be a few years before we know to what extent optical fibers will replace copper wire and coaxial cable.

## II.
## GOVERNMENT TELECOMMUNICATIONS RESEARCH AND POLICY DEVELOPMENT

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## PREFACE

On March 29, 1976, the Aspen Institute Program on Communications and Society convened the second in a series of Washington staff seminars on issues of communications policy. The theme on this occasion was "Research and Policy Development," with an emphasis on the need for integrative planning and perspective by the national government in dealing with communications issues. The House Subcommittee on Communications had held hearings on this subject in the summer of 1975, and its report, published in December 1975, served as a foundation for the Aspen seminar. At the time of the seminar, the Aspen Institute had also just announced the inauguration of its own major project to investigate the adequacy of institutional arrangements and processes for communications policy-making.

Among the four speakers at the seminar, Mr. Shooshan began the meeting by summarizing the House Committee report, its background, and some of its implications. Professor Wood then suggested some structural alternatives to the present federal communications-policy development system. He also proposed criteria for evaluating those alternatives. Professor Capron followed with a review of broad principles which should guide a realistic view of the communications-policy process. Finally, Dr. Elton addressed the American policy research and planning system from a transatlantic perspective.

Both the comments of the speakers and the ensuing general discussion at the seminar went substantially beyond the scope of the House Subcommittee report. For this reason, and because the points made by the speakers diverged widely, the Aspen Communications Program came to the conclusion that a simple summary of remarks from the seminar would not accurately reflect the tone of the discussion. The Program therefore asked Dr. Elton to put together this more comprehensive paper, which synthesizes the major points made by the participants at the meeting.

The paper is not intended to be an exhaustive summary of the seminar, nor should it be taken as a complete representation of the views of any one participant. Rather, it is intended as a structure which points up some of the discussants' more provocative remarks and ideas. In addition, although Dr. Elton's paper offers no specific recommendations for institutional change, it does outline an analytical framework of considerations to be borne in mind in structuring the organization of research and policy development. As such, this document should contribute to the more detailed process of institutional exploration typified and spearheaded by the inauguration of the Aspen Institute's Project on Communications Policymaking.

F. C.

# GOVERNMENT TELECOMMUNICATIONS RESEARCH AND POLICY DEVELOPMENT

*Compiled by Martin C. J. Elton*

The purpose of this paper is to comment on the nature of the federal government's role in telecommunications research and policy development. In order to appreciate that role, we must first consider, in general terms, how policy functions in bureaucracies and the peculiarities of telecommunications policy.

## The Role of Policy

Policy is an essential means of managing uncertainty. It expresses an intention by the policymakers to adopt certain measures in order to achieve higher-order ends. If it were clear which means would be the most effective, common sense could substitute for policy. However, when these means remain unclear, policymaking helps to reduce the uncertainties that must be taken into account by those who have the responsibility for planning and/or decisions. Conflicts between values or the relative effectiveness of alternative courses of action are examples of such uncertainties.

Within the government, policy helps ensure that separate decisions support one another in maintaining progress toward agreed-upon goals. The more dispersed the decision-making in government, the more important policy-planning becomes. For institutions outside of government, policy reduces uncertainty about how government will act.

The definition of the federal government's role in the field of telecommunications is itself a policy issue that is central to the design of the government's policymaking system; for the federal role in telecommunications must be consistent with its responsibilities in defense, international trade, the maintenance of United States scientific and technological leadership, and the procurement of telecommunications systems and services for the government's own use. Federal roles in health, education, welfare, and transportation also have implications for telecommunications policy. Beyond that, there are federal decisions to be made about the nature and degree of official interventions into the market—whether by restrictive regulations or positive promotion—in the interest of private consumers of telecommunications goods and services.

Development of federal telecommunications policy is therefore a matter of considerable difficulty. The industry and its products are changing rapidly. The contributions of telecommunications to society lie largely in improvements in the effectiveness and efficiency of the organizations that use the products of the telecommunications industry. But such improvements often require that other changes be made, too; and any estimation of overall costs and benefits is inevitably problematic. Moreover, the prospect of collision betweeen the giants in computer technology, telecommunications, and mail—International Business Machines, American Telephone and Telegraph, the United States Postal Service—becomes more probable. William Capron points out that

> Rapidly changing technologies in the telecommunications field have impacted on a setting which was already confused and full of conflict, with no clear policy direction and an overburdened and inefficient regulatory mechanism, exemplified not only by the Federal Communications Commission, but also by a plethora of state and local regulatory agencies and policies. Given the complexity of this scene, together with its rapid state of change, it is not surprising that we look in vain for sophisticated and clear-cut policy alternatives that have any chance of being implemented. In short, there is *no quick* policy fix and *no quick* and easy organizational fix. Nor is there a neat "technological" fix.

Problems in the telecommunications field are exacerbated by the differences between that field and other areas addressed by federal policy. The importance and impact of policy in such areas as the environment, energy, and transportation are apparent. The presence or absence of particular policies in these areas threatens to deprive a wide spectrum of people of what they have already enjoyed. In telecommunications, however, the effects of lack of policy or of poor policy are much less likely to be apparent. The threat is to tomorrow's promise rather than to yesterday's reality.

As a result, there is a real risk that the development of telecommunications policy will not be taken seriously enough. The current congressional interest in the field, as represented by the recent activities of the House Subcommittee on Telecommunications, is amply justified. There is an urgent need for greater public visibility of communications-policy issues and for the strengthening of the institutions that will create that visibility.

**The Contribution of Research to Policy Development**

The uncertainties with which one must grapple in developing telecommunications policy establish a *prima facie* need for research. However, the implied analogy with industrial research and development, though useful, must not be pressed too far. The contribution of research to the development of telecommunications policy goes beyond what is generally meant by the term "policy research," in that policy research in the telecommunications field cannot be separated from the developmental process.

Research may contribute to telecommunications-policy development in the following ways:

- identifying possible needs for new policy;
- improving understanding of how telecommunications may be better used to serve society; and
- analyzing policy problems.

***Identifying needs for new policy.*** The first function of research in policy development is one of continuous monitoring in order to provide an early warning of the need to develop new policy, to change existing policy, or to improve the ways in which policy is being implemented. The researcher's role is not so much to answer questions about the implementation or effectiveness of present policy as it is to spot and investigate possible problems and to provide efficient means by which others may answer such questions.

There is another aspect, too. The research community must also be encouraged to detect emerging problems and opportunities which have eluded the formal monitoring procedures already established by policymaking institutions.

***Improving understanding of telecommunications uses.*** It can be left to the private sector to conduct the research and development necessary for market exploitation of the many innovations in the field of telecommunications. A most important governmental role remains, however, in

- determining the side-effects of the diffusion of innovative technology or of new applications of existing technology;
- exploring possible innovative uses which would not be adequately researched within the private sector; and
- ensuring that standards are adopted which protect the public and prevent waste of national resources.

Such systematic investigation of secondary and subsequent effects of technological innovation is

a central feature of the relatively new research specialty of technology assessment—*i.e.*, that research which explores the feasibility, costs, benefits, marketability, and social and economic effects of proposed technological applications. The contribution of technology assessment to the *development* of policy arises from the need to know which technological innovations would indeed be feasible and cost-effective, and how governmental policy might be developed to remove present or future barriers and to implement these innovations.

An example of the need for such research arises with those telecommunications services which may, by substitution or other means, alter demands for transport. One cannot simply argue that the government should leave such private-sector applications of telecommunications to be researched by others. There may well be implications for government policy in the potential of these services to conserve energy or to change the future use and form of cities. These implications need to be explored.

Much applications research in the U.S. has proceeded on a "try it and see" basis, using field trials. As a result, there is sometimes a tendency to confuse demonstration projects with field trials. Strictly speaking, the term "demonstration projects" should imply that feasibility has already been established. While demonstration projects offer research opportunities—to obtain better estimates of costs, for example—their primary purpose is educational. They may be required in order to implement policy, but they have a subsidiary role in policy development.

Applications research also has a part to play in determining the standards to be used in regulations designed to protect individuals from physical dangers, intrusions on their privacy, and so on. In a more technical sense, standards are often necessary to ensure some degree of compatibility between various telecommunications systems. This, too, imposes a research requirement.

***Analyzing policy problems.*** The term "policy research" is most often used to describe the analysis of policy problems. Such research seeks to identify alternative policy positions, to estimate their respective consequences, and to provide a framework for the selection of one of them. The aim of this type of research is not so much to produce a recommendation as to attempt to raise the quality of the debate out of which policy emerges. This process generally requires development of a framework for the debate, distinguishing the needs for factual judgments from the needs for value judgments, and seeking the best answers that the state of the art will allow.

Policy research in this sense is dependent on other research inputs into the processes of policy development: The earlier the warning of policy problems, the less cramped the time-scale within which the analysis must operate. Similarly, the more advanced the state of the applications research, the fewer the uncertainties with which the analysis must grapple.

**Improving the Value of Research for Policy Development**

Certain general principles and priorities should guide us in obtaining full value from the contributions that research may make to policy development:

***Early warning.*** The early warning function can be achieved in part by the routine monitoring of statistics. (An obvious example is in the area of international trade in telecommunications equipment and services.) It is natural to consider this early warning function as an appropriate concern of one or more of the federal agencies. The extent to which government is able to fulfill this role depends upon the quality of formal and informal scientific and technical information in the field as a whole, the receptivity of relevant federal agencies to such inputs, and a clear delineation of responsibilities among the various government offices.

When more than one federal agency is involved in the same general fields of research, it is important that responsibilities be assigned so as to minimize the chance that relevant topics will disappear into the gaps between the agencies. Another problem that can arise here is the possibility that the statistical data may be gathered according to classification schemes designed for other purposes and not as suitable as they might be for monitoring.

***Applications research.*** Applications research has a particularly important role in support of policy development. A good deal of the "demonstration" type of activity in this field in the last few years has been supported by NSF, HEW, and other agencies, so it may be useful to suggest some interim conclusions.

A frequent method of inquiry has been the field trial, in which the researcher seeks understanding by implementing the innovation in question and studying what happens. This approach has caused much more difficulty than had been expected, which suggests that some assumptions made about the eventual role of advanced telecommunications services may have been wrong. One example is the longstanding assumption that interactive video for delivery of social services would be both necessary and economical. Actually, field trials seem to be revealing that interactive video adds little to what audio and graphics can offer, and that the extra benefits cannot be justified on cost grounds for some time to come.

Another example is provided by the generally implicit assumption that once the technology has been installed, there would be no serious barriers to its utilization, particularly if it is free to the user. Already, however, it is apparent that the problems are considerable in guiding people and organizations through the necessary processes of individual and institutional adaptation in so fundamental an activity as communications. These problems are frequently exacerbated by the multiplicity of organizations—many of them local agencies of all levels of government—with which an implementation team must be involved. It is appropriate to ask how the federal government could best support those who are supporting its policy development at the grass-roots level.

There is also a clear need for synthesis and evaluation of the results of the field trials undertaken so far. The knowledge obtained from them is far too fragmentary. This, it should be noted, is a key component in NSF's telecommunications research plan, but the time is only now becoming right for its implementation.

For the considerable number of research workers not drawn into the field, it is important that they begin to improve their methods on the basis of their own and others' experiences. Synthesis and evaluation will help; the quality of program management by federal funding agencies is of importance, too. The latter is a matter not just of the caliber of the managers, but of the organizational support for them as well. Clearly there are dangers if organizational fragmentation is such that large and demanding programs are run from very small offices.

The problem of fragmentation is difficult. There are many federal agencies which have responsibility for telecommunications research—OTP, OT, NSF, OTA, and FCC, as well as the telecommunications offices located in HEW, HUD, DOT, and so on. It is essential that the leadership of some of the telecommunications-research programs come from within the latter group of federal agencies, which have direct responsibilities for the fields in which the research applications are being considered: health, education, welfare, transportation, and others. But there is the real danger that, under pressure of work, these telecommunications offices will eventually become isolated from other parts of their parent organizations. This could give us the worst of both worlds.

It was remarked earlier that the objectives of demonstration projects are primarily educational.

Dissemination, however, is a key part of the research process as a whole, and demonstration projects provide a valuable means of dissemination. They stimulate the quantity and quality of research conducted in the private sector or collaboratively between the private and public sectors.

Finally, we should keep in mind that applications research involves far more than field trials. Less glamorous, maybe, but essential in removing significant uncertainties is the research on costs and on existing patterns of communications.

***Policy research.*** Although the best organizational structure for policy research and development is a matter of some controversy, we would expect agreement with the following observations:

1. Telecommunications is a critical national resource, and the applications of telecommunications could have considerable impact upon the quality of life.
2. Telecommunications policy should be addressed in terms not only of producers and suppliers but also of users and consumers across the full spectrum of society.
3. Telecommunications is a field of considerable technical complexity and one that is changing rapidly.
4. The impact of innovative applications will be distributed in complex ways which challenge the state of the art of evaluation.
5. Policy development should be an open process which encourages and takes advantage of multiple inputs from interested parties inside and outside government.
6. Policy research and development require the use of interdisciplinary teams, and it often takes two or to three years to turn an able collection of individuals into an effective team.
7. The importance of telecommunications policy is such that there must be a policy-development function within the federal government which enjoys easy access to policymakers, yet retains a degree of political independence.
8. However the federal government's in-house policy research and development function is organized, it is clear that the organization must have a broad mandate and sufficient personnel. It also requires a reasonable assurance of institutional stability for some five to seven years.

**Organizational Implications**

The foregoing discussion suggests the following guidelines for a redesign of the policymaking system.

1. Unwieldiness must be avoided. This has implications for the number of actors there should be in the federal government, the communications between them, and the way they should be coordinated.
2. Research must be of the highest quality, so that policy is developed on the basis of the best possible understanding of the field. A balance must be struck between the use of in-house and external research resources, and the former must have access at a high level.
3. Conflicts of values must be disentangled from uncertainties about effectiveness. Open debate and proper structuring of the issues will contribute to this. The public interest must be paramount; it may be necessary to provide a countervailing force to the power of vested interests.
4. There must be a willingness to confront issues. "No win" situations can be expected: This is no business for those who desire a quiet life or are inhibited by the fear of making mistakes. Leadership is essential, and there must be a careful allocation of responsibilities so that important issues are not lost in the policymaking system.
5. There must be confidence that the federal government is ready and able to implement policy. If

the institutions that develop and implement policy are not trusted; if there is an expectation that policy will be changed too frequently; if there are insufficient resources or inefficient means for implementing the policy, then it will not be taken seriously, and the quality of the inputs into the development of future policy may well suffer. These considerations require that a long-term view be taken, that institutional legitimacy be safeguarded, and that adequate powers and resources be assigned.

6. To be effective, federal policy researchers have to have access to policymakers and must be able to convince them to accept analysis as a legitimate means of improving decisions. Multiple strategies should be adopted for gaining this acceptance, including
   (a) communication with policymakers in formats permitting concise and timely presentation of findings;
   (b) education of present policymakers (*e.g.*, through seminars, conferences);
   (c) education of future policymakers (*e.g.*, through training programs, graduate programs);
   (d) sensitization of and interaction with relevant interest groups and opinion leaders;
   (e) development of new interest groups or new "roles" within existing groups.
7. Means must be developed for resolving conflicts between telecommunications policy and other federal policies. Such conflicts may well arise in future from the scale of national investment in telecommunications, from threats to employment, or from threats to the quality of competing services (e.g., "cream-skimming" off the Postal Service).

**Some Practical Steps**

A number of deficiencies in the existing organizations and conduct of the federal government's policy research and development were identified in the recent report of the House Subcommittee on Communications. Several practical steps were recommended to combat these deficiencies, and it is encouraging that most of the recommendations have been, or are being, pursued.

Briefly, the recommendations of the subcommittee were as follows:

1. Permanent directors of the Office of Telecommunications Policy and the Commerce Department's Office of Telecommunications should be appointed as soon as possible.
2. The Federal Communications Commission's Office of Plans and Policy should be strengthened.
3. The establishment of an Office of Chief Scientist at the Office of Telecommunications Policy should be considered.
4. An industry and research advisory group should be established for the OTP.
5. The dialogue among government agencies with responsibilities in telecommunications should be improved.
6. A closer relationship between those agencies and Congress should be established through oversight hearings, staff contacts, and the use of the Congressional Office of Technology Assessment.
7. More attention should be given to the international trade implications of telecommunications policy.
8. Congress should take a more active interest in telecommunications-policy research and development.

These steps proposed by the subcommittee were not intended to divert attention from the almost certain need for more fundamental change. Indeed, their aim was not just to "patch up" the present situation, but to improve the ability of different parts of the overall system to engage in the process of developing longer-term solutions. The organizational structure of telecommunications-related

functions within the federal government is itself a crucial matter of telecommunications policy, and the present actor groups have potentially significant parts to play in redesigning it.

There are other courses of action that could soon be set in motion which would either help in the process of solving the longer-term organizational problems or would be worthwhile in the context of the present structure and any of its likely successors:

1. It would be most helpful to develop and maintain an up-to-date picture of the total federal government involvement in the different parts of the telecommunications field. An example is provided by the House Subcommittee's request to GAO to undertake a survey of federally funded cable television demonstration projects.
2. Such a survey would provide a basis for indicating gaps which ought to be filled and for determining the extent to which efforts seem to be duplicated. Some overlap is essential, and duplication need not imply waste of resources. Nevertheless, unwitting duplication is a cause for concern.
3. As the time becomes ripe in particular areas of telecommunications services, high priority should be given to synthesis and evaluation of the results of the research and demonstration projects.
4. Consideration should be given to how the federal government could provide support—other than or in addition to funding—to those who are implementing the applications of advanced telecommunication services in the field.
5. There should be discussion with the industry to determine the scope for collaboration between it and the federal government in mounting further demonstration projects. This must be done, however, in recognition of the fact that the federal interest is to help industry develop and market services which would be economically justified, not to help industry by subsidizing economically unjustifiable telecommunications applications.
6. Those who fund field trials should recognize the need for a high level of scientific expertise and for continuity of funding.
7. Thought should be given to whether and how the fragmentation of executive branch telecommunications activities could be reduced. This need not necessarily be a matter of bringing all of the activities together. It may be more a matter of ensuring that the right relationships exist between the separate parts; *e.g.*, OT's program on radio systems, NBS's Bureau of Computer Science and Technology, NASA's satellite programs, GSA's procurement activities, and so on. We can rely on the balance of powers, rather than inefficient fragmentation, to provide the necessary check on the powers of the executive branch.

A fitting conclusion is provided by two points made by William Capron about government organization for communications-policy research and development. While many people concerned with this field might not agree with Mr. Capron's comments, his criticisms of fundamental organizational alternatives should be considered carefully:

> The first point I want to make is that no matter what, there is a need for a strong Presidential role in telecommunications policymaking and implementation. I hold this view because of the very complexity of the issues and the fact that there are so many strong interactions across a number of activities, both public and private. It is only at the level of the Presidency that the necessary overview can be developed and fundamental trade-off questions can be handled. Thus, we need an OTP, or something like it, close to the President. Indeed, Executive Order 11556, which established OTP, set out its Presidential role in a fairly sensible fashion. Unhappily, it is my impression that much of that mandate has yet to be realized.
>
> I might add that some have suggested that the imminent re-creation of a Presidential Science Advisor (with staff) would supersede the need for a separate OTP. I would argue that this is a misperception of the role of the Science Advisor function as it should be, with the exception,

possibly, that the Science Advisor might assume the Presidential oversight role with regard to federal R&D undertakings and support in the telecommunications field.

The second major point I wish to make is that we should welcome a multiplicity of organizations, both public (including executive and congressional) and private, engaged in policy analysis in the field of telecommunications. We are still so far from the clear identification of policy options in this area that we need the protection of what is sometimes called redundancy and duplication, lest a single, powerful organizational voice—which will inevitably have its own blind-spots and biases—lead us down a garden path which turns out to be full of brambles and chuckholes. From this general posture, it is not surprising that I come down strongly against the creation, at this stage, of a single Department of Telecommunications. Rather, it suggests that I would like to see the planning and policy analysis of the Federal Communications Commission strengthened. I would be happy to have an independent capability developed in the Department of Commerce, which is not solely subservient to OTP. And, finally, I think Congress and its committees and committee staffs, as well as various taff agencies, such as OTA, can all contribute to the exploration of alternative policy options and their organizational implications.

# III
# PROBLEMS OF REGULATING SPECIALIZED TELECOMMUNICATIONS COMMON CARRIERS

*by*

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## PREFACE

This paper by Dr. Leland L. Johnson was presented at a seminar conducted by the Aspen Institute's Program on Communications and Society on May 10, 1976, in Washington, D.C. Along with the presentation of the paper, there were comments by three panelists and a general discussion by the participants in the seminar, who included federal officials concerned with telecommunications policy, representatives of the telecommunications industry, and other interested individuals. The paper is reproduced here, together with summaries of the comments and the discussion.

F. C.

# PROBLEMS OF REGULATING SPECIALIZED TELECOMMUNICATIONS COMMON CARRIERS

*Leland L. Johnson*[1]

In contrast to the traditional view of the telephone industry as a natural monopoly to be regulated along classical public utility lines, the FCC's *MCI* decision in 1969, its *Specialized Common Carrier* decision in 1971, and its "open skies" policy with respect to satellites, which was announced in 1972, have permitted new carriers to enter the field in competition with the Bell System, Western Union, and among themselves.[2]

In the specialized terrestrial common-carrier field, we now have the MCI Communications Corporation and its several affiliates, the Data Transmission Company (Datran), the Southern Pacific Communications Company, and United States Transmission Systems. Among satellite carriers, Western Union, the American Satellite Corporation, and RCA Glogcom are now operating, with other systems still in the planning stages. In the value-added, packet-switched field, two firms are currently supplying service: Telenet Communications Corporation and Graphnet Systems.

These developments have generated much controversy (a) about conditions under which new and existing firms should be permitted to operate, (b) about their pricing structures, and (c) about how these firms should be regulated in light of the Communications Act of 1934. The purpose of this paper is to discuss these issues and to examine both the problems posed for regulation and the prospects for the future of specialized carriers. Three major aspects of the controversy will be considered:

1. The effects of the competition on the ***distribution*** of costs and benefits among users, especially between business and residential users.
2. The effects on the ***efficiency*** with which facilities are built and operated. This involves questions of whether undue duplication would arise, which depends, in turn, on the economies of scale relative to traffic loads.
3. The effects on ***innovation,*** which can lead to reductions in costs for existing services and to the introduction of new services.

## Distribution of Costs and Benefits

We have all heard the argument that larger firms, which are able to take advantage of competitive offerings, stand to gain from the introduction of competition, but that their gains would be at the expense of other customers, especially those dependent on the public message telephone network. New firms free to choose competitive areas of entry will naturally be attracted to those areas in which potential profits are highest (primarily private-line services on lucrative routes between major metropolitan markets). This process of "cream-skimming" would shift the cost burden to services that remain non-competitive, whereas the present Bell System operation uses nation-wide cost averaging to balance the relatively high costs of some services and routes with surplus revenues from others.

There are two basic responses to competitive pressure, either of which would result in such a shift of cost to the remaining monopoly services:

1. Bell would be permitted to compete directly by abandoning nation-wide cost averaging and adjusting rates to reflect underlying costs more accurately. This would reduce or eliminate competitive entry, but only so long as the differentiated rate structure was maintained.
2. Bell would be required to maintain nation-wide averaging for particular service categories. Other

firms could then siphon traffic from high-density routes and force a reallocation of Bell's costs to services and routes not subject to competitive pressure.

Numerous studies and other submissions under FCC Docket 20003[3] have examined the degree to which cost and revenue requirements would be shifted from one user class to another as a consequence of competition both from specialized common carriers and from interconnect companies. One study prepared for the independent telephone industry projected that by 1985, the increase in monthly revenue requirements as a consequence of the combined impact of interconnect and specialized common-carrier competition could amount to $3.28 and $7.25 respectively for each residential and business main station.[4] However, the conclusions of all such studies tend to be colored by the assumptions and concerns of the sponsoring organization. As the chief of the FCC's Common Carrier Bureau has observed:

> The fact is that in order to reach the penetration-level forecast in one industry-sponsored study, the specialized carrier industry would have to grow by a factor of 140 over the next decade, which amounts to a rate of 70 percent annually *compounded.*[5]

Another complication in assessing the effects of competition is the definition of boundaries between those services which are natural monopolies and those in which competitive entry would be in the public interest. It is becoming increasingly apparent that these boundaries are fuzzy, whereas the commission's decision in the specialized common-carrier case was premised on the notion that a clear distinction existed between the public switched telephone network, generally deemed to be a natural monopoly, and private-line services in which competition might provide a feasible alternative. As noted by AT&T:

> The FCC concluded that the specialized common carriers would not divert business from the telephone companies or "pose serious threats to the established carriers' price averaging policies." On the contrary, the FCC said that the development of such specialized common carriers actually would increase the revenues of existing carriers by expanding the size of the communications market.[6]

Nevertheless, some services offered by the specialized carriers are taking on progressively more of the characteristics of message toll service—partly as a consequence of the commission's decision to permit the specialized carriers to have access to foreign exchange (FX) and to common-control switching arrangement services (CCSA) in their agreements with Bell. As the chairman of the FCC has noted:

> . . . let me reiterate my own opinion that the commission's CCSA and FX decision should be read as approaching the outer limits of permissible private-line offerings. I do not believe that any encroachment by any specialized carriers upon traditional MTS or WATS services should be tolerated.[7]

One salient example is MCI's "Execunet," which was introduced in 1974. In mid-1975, the FCC concluded that this service was essentially a switched public telephone service similar to Bell's offering, and that the service should therefore be withdrawn. MCI immediately appealed to the courts, and at this writing the situation remains unsettled.

The difficulties arising from the fuzzy boundaries are compounded by the less-than-distinct relationships between the demands for various services. One consideration that has been neglected in the past debate is the *cross*-elasticity of demand existing between private-line and other services. For example, private-line service tying together only two points is available at reduced rates; and although this service is apparently different from both WATS and public message toll service, it nevertheless draws traffic from both. With progressively lower-priced private-line services (and with specialized carriers

offering some switching capability for additional flexibility), a firm may find it advantageous to purchase one or more private lines to *each* of its scattered branch offices or to other points where it has a high traffic volume, rather than to use the switched public network. (In the extreme and wholly theoretical case that the price of private lines were to fall to *zero,* then everyone would prefer to purchase a private line to *each* point to which communication is desired as a total substitute for message toll services!)

Given the potential effects of cross-elasticities of demand, if competitive entry continues in the coming decades, public message service could become increasingly confined to residential and small business use. Expanding upon the approach employed in previous studies—such as the SAI study noted above—one could quickly conclude that cost allocations to this increasingly small proportion of the total long distance market, and to local telephone service, could become very large.

At the same time, several mitigating circumstances need to be carefully taken into account. First, although the non-competitive message toll portion of the industry might fall as a *proportion,* it would still be expanding at a rapid rate, measured in absolute terms. Projections covering a 10- or 15-year period must take into account the fact that growth is likely to continue and provide a progressively larger base to cover costs of operation.

The table shows the rapid increase in interstate message toll service for business and residential use. The number of messages is increasing for both categories, and the length per residential message minutes. The number of message minutes for residential use alone (18.9 billion in 1974) is equal to the *combined* total for business and residential as recently as 1969. Although we cannot assume that future growth will be as rapid as that shown in the table, the continued growth of residential service and the possible continued growth of business traffic would reduce pressures for rate increases in non-competitive long distance and local telephone service—even with some diversion to competitive services.

**Interstate Message Toll Telephone Traffic for the Bell System**

| Year | *Number of Messages* | | *Paid Minutes per Message* | | *Total Message Minutes* | |
|---|---|---|---|---|---|---|
| | Business | Residential | Business | Residential | Business | Residential |
| | (Billions) | | | | (Billions of minutes) | |
| 1962 | 0.53 | 0.54 | 6.36 | 7.76 | 3.4 | 4.2 |
| 1963 | 0.60 | 0.60 | 6.41 | 8.02 | 3.8 | 4.8 |
| 1964 | 0.64 | 0.66 | 6.40 | 8.28 | 4.1 | 5.4 |
| 1965 | 0.72 | 0.76 | 6.40 | 8.54 | 4.6 | 6.3 |
| 1966 | 0.82 | 0.85 | 6.41 | 8.86 | 5.3 | 7.5 |
| 1967 | 0.86 | 0.91 | 6.38 | 9.03 | 5.5 | 8.2 |
| 1968 | 0.99 | 1.07 | 6.34 | 9.22 | 7.3 | 9.9 |
| 1969 | 1.14 | 1.22 | 6.34 | 9.40 | 7.2 | 11.5 |
| 1970 | 1.24 | 1.33 | 6.35 | 9.50 | 7.9 | 12.6 |
| 1971 | 1.36 | 1.43 | 6.20 | 9.47 | 8.4 | 13.6 |
| 1972 | 1.49 | 1.60 | 6.10 | 9.61 | 9.1 | 15.4 |
| 1973 | 1.71 | 1.79 | 6.08 | 9.77 | 10.4 | 17.4 |
| 1974 | 1.80 | 1.90 | 6.09 | 9.97 | 11.0 | 18.9 |

*Source:* Data computed from "Bell System Selected Interstate Data under the Division of Revenues Contracts and Long Line Statistics, 1950-74," April 1975, pp. 107, 118.

Second, one must assume continued technological advance over the long period of concern here. In particular, the potential commercialization of fiber-optics technology and the continued development and installation of electronic switching equipment must be considered. Although we do not know the extent to which unit costs would decline as a consequence of these and other possibilities, they would work in the direction of benefiting residential and other small users.

Third, attractive possibilities exist for pricing policies *within* a service category. Take, for example, the objective of maintaining "universal" telephone service and, especially, of serving low-income groups on reasonable terms. There could be expanded use of "lifeline" service, involving a low monthly flat rate, an allowance for a few free calls, and metered service for additional calls. Similarly, telephone companies in a number of states are moving toward usage-sensitive pricing. Today, about 90 percent of residential telephone subscribers are more than half of the business. Subscribers pay a flat monthly rate for telephone service for an unlimited number of local calls. This policy permits one residential user to tie up costly local switching and distribution facilities for hours, while another customer, paying the same monthly rate, uses the telephone for only a few minutes a week.

Of course, with payments on a per-call basis, a family may end up paying much more with metered service than with flat-rate service. However, with metered service and a relatively low basic monthly rate, telephone service can be made available for segments of the population under conditions more favorable than those today. If individuals then *choose* to use the telephone extensively, they should be fre to do so in the same way that they make choices among all the other commodities and services. The critical consideration is that even though competition may force some redistribution of costs toward message toll and local services, basic high-priority use of telephone service would remain available under favorable terms.

Fourth, a particularly disconcerting aspect of the current controversy is the underlying assumption that whoever benefits from competition keeps the whole amount and whoever loses thereby suffers irrevocably. There is little recognition of the fact that cost savings to one group may be *passed on* at least in part to another group. In particular, little consideration is given to the probability that cost reductions to the business community would be passed on to consumers—including the low-income groups whose interests everyone seems to want to protect. Using rudimentary tools of economic theory, one can show that even a monopoly will pass on a portion of any cost reduction to its customers.[8]

In summary, on the basis of current empirical analysis, we cannot confidently predict the long-term effects of specialized common-carrier operations on rates to residential and small business users unable to take advantage of competitive offerings. Much depends upon the growth rate of specialized common-carrier services, the competitive response of Bell, and the overall continued growth of both monopolistic and competitive services as a consequence of continued growth in national income and the substitution of telecommunications for other services. However, firms that *do* take advantage of competitive offerings can be expected to transfer some of the benefits to consumers, and continued technological advances will tend to reduce the cost of *all* telecommunications services. These considerations, combined with "lifeline" services and the fact that nearly universal telephone service has already been attained, suggest that the growth of specialized common-carrier systems will not jeopardize the nation-wide telephone system or seriously disadvantage low-income groups.

**Efficiency of Development**

The natural monopoly argument is predicated on the notion that the economies of scale are so large that construction of facilities by separate entities would be wasteful. Why build a separate transmission facility, say between Chicago and St. Louis, when expansion of existing facilities can perform the same function at a lower *incremental* cost?

On theoretical grounds, there is a straightforward answer: Let the market decide. Let the existing carrier abandon nation-wide pricing and compete with new entrants, subject to the constraint that its new prices remain at levels *no lower than* its long-run incremental costs in providing the service in question. If these incremental costs are indeed lower than the costs that competitors would incur in operating new facilities, then the competitors will be discouraged from entering, the duplicate facilities will not be built, and society will continue to benefit from the scale economies offered by the natural monopoly.

Unfortunately, two major problems arise in pursuing this approach. The first is the enormous task of determining what in fact constitutes long-run incremental costs for particular services and routes. Serious practical difficulties arise: (a) how to reallocate costs among the services and routes of plants with varying productive efficiencies; (b) how to measure the impact on costs in one segment of the system if facilities are expanded in another segment; (c) how to determine the length of time required for measuring long-run effects. Because of such difficulties, the FCC has received reams of exhibits dealing with principles of cost allocations and underlying data to support or attack particular tariff filings.

A second problem, related to the first, is that of predatory pricing. Many have argued that the monopolist would have an incentive to cut rates even below its long-run incremental costs in order to discourage competition, while shifting the additional burden of these low rates to its protected services. Even if it were possible to satisfactorily measure long-run incremental costs, there would still be the difficulty of constraining the firm from setting rates no lower than that level. This problem, too, has played a leading role in the reams of exhibits that have accumulated in rate cases.

A salient example is AT&T's response to specialized carriers in offering its hi-lo voice-grade private-line tariff, which was originally to be made effective in January 1974. In supporting the tariff, AT&T asserted that without changing private-line offerings, Bell would lose $200 million of interstate revenue and more than $100 million in contributions to its overall system. After several months of delay while the FCC considered appeals of contesting parties, the hi-lo tariff went into effect in June 1974. It was Bell's first departure from nation-wide pricing since 1893.

Hi-lo rates filed by Western Union went quickly into effect as a countermeasure, and MCI moved to revise its tariff as well. At the same time, MCI opposed the AT&T filing on grounds that Bell had failed to produce evidence to support its contention that specialized common-carrier competition was having or would have a substantial impact upon its operations. Datran also took issue with the hi-lo plan on grounds that the rate changes were not justified on the basis of underlying cost, and that they were designed to forestall competition in an area in which it had not yet had the opportunity to develop.

After more months of deliberation, the FCC decided in January 1976 that it agreed with the hi-lo approach in principle. Nevertheless, the new tariff was not warranted on grounds that insufficient cost data and other evidence had been presented by AT&T to support its previous filing. In response, AT&T filed a "multi-schedule" private-line voice tariff three months later. It remains to be seen whether the new tariff will be subject to the same sort of objection by competitors as was the earlier one.

Another example is AT&T's introduction of Dataphone digital service (DDS), with plans to build a 96-city nation-wide network. As in the situation with the hi-lo tariff, opponents questioned whether the rates accurately reflected underlying costs or whether they were "anti-competitive" or predatory—again a judgment that depends upon extraordinarily complex issues. After extended controversy, the FCC authorized the proposed Dataphone digital-service tariff rates in late 1974—but initially for only a five-city network in a one-year trial period. For an additional 19 cities, data users were to pay higher private-line rates during the trial period.

In May 1975, AT&T's rates for Dataphone digital service attracted heavy fire in testimony by Datran and the Independent Data Communications Manufacturers Association. An accumulation of 15 exhibits was submitted to demonstrate that DDS rates were "anti-competitive" and that the cost basis was substantially understated by AT&T. At this writing, the case has not been settled, but the commission notes that "We agree with AT&T that the volume and complexity of the findings filed requires considerable study in order adequately to reply to them."[9]

This behavior is quite consistent with what one would anticipate. Once the FCC permits the specialized carriers to operate, and after they have been successful in forcing AT&T to provide interconnection facilities on reasonable terms, they could be expected to oppose attempts by AT&T to compete with them by abandoning nation-wide price averaging. Clearly, it is in their interest for Bell to maintain its relatively high rates on the lucrative, high-density routes and to be precluded from offering new services on highly favorable terms. On the other hand, Bell poses a powerful threat if it is able to cut rates and absorb the difference in its non-competitive services.

Moreover, controversy has arisen not only between the specialized carriers and Bell but among the specialized carriers themselves. As one example, MCI objected in mid-1974 to the domestic-satellite tariff filings by Western Union and by American Satellite Corporation because of the alleged refusal of the two companies to reflect distance-insensitive cost characteristics of satellite technology. Since the cost of satellite circuits is independent of distance, some have alleged that satellite circuits should be priced independently of distance. This would open the market for which satellites have a comparative advantage—long routes spanning many hundreds of miles—while leaving to terrestrial carriers the shorter routes over which microwave costs *are* a function of distance.[10]

When the FCC approved in 1974 a request by United States Transmission Systems (a subsidiary of ITT) to build a specialized common-carrier system stretching from New York to Houston and serving major cities en route, several carriers objected on the grounds that the entry of ITT would have an unduly severe competitive impact, especially since this would involve an international carrier entering into the domestic field and presumably the possibility of reciprocal favored treatment by two arms of the same company. Again, in early 1967, Graphnet filed an objection to the ITT Domestic Transmission System's application for a packet-switched digital-data communications network. Graphnet characterized the network as a threat to value-added service by virtue of ITT's size, its economic strength, and its common-carrier status, particularly in the international field.

Despite the massive filings in rate proceedings in recent years, we still cannot say with assurance whether predatory pricing is now taking place on a widespread scale, or whether much waste and duplication is arising as a consequence of facilities being built by specialized carriers. But with respect to the latter question, there are promising developments. One is the shared use of facilities by the specialized carriers. For example, agreement was reached in 1974 between Datran and the Southern Pacific Communications Company to co-locate and jointly build microwave networks linking St. Louis, Chicago, and points along the East Coast. Of course, carriers have had a long history of leasing facilities from each other—even competitors. Most notably, the recent agreement reached between Bell and the specialized carriers with respect to Bell's distribution facilities, including FX and CCSA, will help to forestall uneconomic duplication. More generally, we may see the emergence of "carriers' carriers," whose express objective would be to build transmission facilities for use by other common carriers. The latter, providing custom-tailored services to a wide range of users, would, in effect, share in the development, construction, and operation of facilities having large economies of scale. Perhaps the best emerging example of this arrangement is the provision by AT&T for facilities used by the packet-switched, value-added carriers. While AT&T is itself a common carrier, one could imagine in the future a firm whose *entire* business consisted of leasing facilities to other common carriers.

**Innovative Services**

A major objective of the FCC's decision in the specialized common-carrier case was to stimulate the development of innovative services. The FCC states in its First Report and Order in Docket 18920 that:

> While there may be some overlap between the services proposed by the applicants in the present offerings of the established carriers, we find sufficient warrant for the staff's conclusion that the applicants are seeking primarily to develop new services and markets, as well as to tap latent but undeveloped sub-markets for existing services, so that the effect of new entry may well be to expand the size of the total communications markets.[11]

Since that time, much controversy has arisen about whether the services offered by the new carriers are in fact innovative. Obvious difficulties arise in quantitatively determining the differences between old services, slight modifications, and major changes. In its 1975 stockholders' report, MCI lists five new services introduced during the last six months of 1975: Quick-line, Execunet, Tel-analysis, Telemanagement, and Advanced Private Line Switching. Other carriers, including those employing satellite circuits, are offering other services tailored to needs that, allegedly, were not previously being well-met.

But the debate rages. According to AT&T:

> The FCC premised its *MCI* and *Specialized Common Carrier* rulings on the assertion that the specialized common carriers would offer "new and different" services, filling a "serious deficiency in the communications services to the public" by providing business communications "with unique and specialized characteristics." The FCC further took the position that it would authorize new specialized common carriers only if it were satisfied that the new companies would provide their own intercity facilities to offer genuinely novel services, and explore areas of demand not tapped by the telephone companies.
>
> In practice the FCC's experiments in intercity services have not worked out as envisioned. The specialized common carriers, in general, have simply duplicated the intercity private lines routes and the services already supplied by the telephone companies. By electing to serve only the most profitable routes, the specialized common carriers have been able to undercut the telephone companies' averaged rates.[12]

The chairman of the FCC has also publicly indicated disappointment at the failure of specialized common carriers to move in more innovative directions than was expected at the time of the commission's decision in 1971:

> ...I frankly have been disappointed that some new carriers—while preaching the virtues of diversity, innovation and specialized offerings in the private-line market—have attempted to establish what, to me, are clearly basic message services. In my opinion, these attempts represent something of a breach of faith with the commission and should be precluded by definitive administrative rulings.[13]

In the midst of this controversy, it is disquieting that little can be drawn from the economics literature to shed light on relationships between market structure and innovative activity. As emphasized in a recent study prepared for AT&T, one can draw several general conclusions from the evidence about relationships between particular kinds of innovative activities and market structure. But we have no satisfactory theory that cuts across industries and identifies either a positive or a negative relationship between market charcteristics and the overall rate of innovation. Whether a monopolistic or a competitive structure is most conducive to innovation depends upon numerous factors that cannot be

systematized across industry lines and time periods. With reference to the telecommunications industry, the study concludes:

> Existing theory and empirical evidence do not support the notion that an increase in total innovative output will occur if more firms are permitted to provide telecommunications services or compete in the provision of equipment to users of telecommunications services.[14]

Although we cannot say with certainty whether competitive pressures stimulate innovation, several factors must be borne in mind. First, it takes time to develop new services, test-market them, and expand them in full commercial form—all the more so if substantial amounts of research and development are required. Innovative services cannot be plucked off the shelf and put on the market, but may require years of development in a laboratory and perhaps millions of dollars before they can be commercialized.

It is easy enough to enumerate the impressive achievements of AT&T, working through Bell Laboratories. But we must remember that AT&T has had decades of experience and many hundreds of millions of dollars with which to engage in research and development. Expenditures by Bell Laboratories in 1973 were about $420 million in comparison with the approximately $30 million of total *revenue* earned by the specialized terrestrial common carriers in 1975.[15] Something would indeed be awry if, with all that effort, a long list of accomplishments could not easily be delineated.

Bell's competitors are barely off the ground. It is simply too early to determine the extent to which they will provide new and innovative services. To this point, much of their energies have been devoted to litigation which would obtain satisfactory interconnection agreements with AT&T to provide end-to-end service. After the FCC's *MCI* decision in 1969 and its more general specialized common-carrier decision in 1971, subsequent years were clouded by controversy about the extent to which, and under what conditions, AT&T would provide interconnection for access to customer premises.

In early 1974, the U.S. Court of Appeals in Philadelphia granted a preliminary injunction by MCI requiring AT&T to provide interstate foreign exchange (FX), local transiting facilities between specialized common carriers providing interstate services, and interstate private-line services connecting common-control switching arrangement (CCSA) facilities, as is now done for AT&T by its own Long Lines department. After further court action, and strenuous efforts by the FCC, agreement was finally reached among MCI, other carriers, and AT&T. This agreement outlined the technical and financial terms and conditions of interconnection arrangements. In the meantime, MCI filed an antitrust suit against AT&T in March 1974, charging that AT&T and its associated Bell System companies "had attempted to monopolize and unreasonably restrain trade in the business and data communications markets in violation of federal antitrust laws."[16]

Under these conditions of instability and uncertainty, it is not surprising that large-scale research and development projects are not being mounted by the new competitors. By its very nature, research and development is a risky endeavor. When the risk is compounded by years of court suits, appeals, injunctions, and the like, the environment is necessarily made less congenial for aggressive research and development activities. However, one development that may have a substantial impact in the future is the entry into the specialized carrier field of large, well-capitalized firms with a long history of innovative activity in related fields.

For example, a joint venture of International Business Machines, Comsat General Corporation, and Aetna Life and Casualty has been formed to develop a domestic satellite system for transmitting to relatively small earth terminals in close proximity to customers' premises. The application currently before the FCC specifies that about $250 million will be spent through 1979, when operations are to begin. According to the application, the system "will permit each customer with geographically dispersed locations to combine voice, data, and image communications into a single, integrated,

private-line switching network."[17] This development, bypassing terrestrial local loops and offering other advantages, could cut markedly the cost of long-distance communications for business users and pose a more serious threat to AT&T than any we have seen to date.

A second case is the entry of ITT into the field through its subsidiary United States Transmission Systems, which has been granted FCC authorization to build a system from New York to Houston as mentioned above. A third case is the entry of RCA into domestic satellite service. Its activities began in early 1974, when RCA Global Communications and RCA Alaska Communications used Canada's Anik II satellite for private-line voice service. Subsequently, two RCA-owned satellites have been launched and are now in service.

**A Promising Future**

The telecommunications industry, including the contributions of specialized carriers, will likely continue to meet the needs of our society. For reasons noted earlier, competition by the specialized carriers will probably not cause such a severe redistribution of costs toward residential and small business users that they will be seriously disadvantaged, or that the nearly universal telephone coverage will be eroded.

Efficiency will be aided by the use of commonly owned and leased facilities, by the potential for development of "carriers' carriers," and, more generally, by the continued growth of the overall telecommunications market to exploit economies of scale. It is important, of course, to avoid umbrella pricing that would encourage uneconomic entry by competitors. Thus, Bell and other carriers must be permitted to respond with modified tariffs in the face of competition—but with the assurance that these reductions will not fall below the cost of rendering the services in question.

Because of the extraordinary difficulty in determining what these costs are, we can expect that one of the most serious problems arising from competition will remain—the enormous administrative burden placed on the FCC and on the courts. The history of rate cases shows the appalling amount of time consumed in filings, pleadings, appeals, postponements, reconsiderations, etc. Perhaps one of the most central needs (an analysis of which falls outside the scope of this paper) is to simplify administrative processes that otherwise will become even more oppressive as the variety of services and firms expands and as continuing technological progress offers new opportunities for public benefit—and for dissension.

This need for simplified procedures is all the more important in light of the danger voiced by many that the telecommunications field will become "cartelized"—a situation in which a few firms would carve out markets for themselves and avoid head-on competition through "gentlemen's agreements." However, if we can judge by recent history, this does not appear to be an overriding present danger. Increasingly we are seeing firms competing head-to-head and new firms invading markets traditionally held as monopolies. The danger is not so much that the FCC would permit or condone cartelization activities, but that slow and cumbersome administrative processes will introduce uncertainties that themselves discourage vigorous competition.

This paper leaves many questions unanswered, but it does suggest optimism in regard to the future of the industry. We should not be misled by the apparent disarray emerging in the industry. In earlier debates, the industry was simply left largely in the hands of the Bell System, and that was that. Fortunately, the inherent nature of the industry, able to take advantage of technological advances especially in the electronics field, has permitted striking reductions in costs and expanding development in new services. With the high income level and economic growth of the United States, a strong market pull for telecommunications services has developed and has led to the evolution of a nation-wide,

well-functioning system.

Now we have new entrants, minuscule at this point in comparison with Bell, and looking toward uncertain futures. We can expect to see mergers and consolidations, bankruptcies, entries by new firms, and, in general, all of the activities which are familiar in *other* industries where competition is permitted and progress has been rapid. To take a chance in permitting similar forces to operate in the telecommunications field does not appear unduly risky.

## COMMENTARY

Each of the commentators at the seminar addressed a separate aspect of the specialized common-carrier field. Bernard Strassburg discussed the early history of specialized common carriers; Leland Johnson outlined the present form and emerging trends of the industry; and Lawrence Roberts addressed the notion of developing a "carrier's carrier" as a possible solution to current problems.

Mr. Strassburg began by commenting that the development of specialized common carriers symbolizes competition in an industry in which monopoly was previously taken for granted. Before its *MCI* decision in 1969, the FCC rarely had an occasion to consider whether there should be competing carriers. By the *MCI* decision, the commission signaled a disposition to favor a competitive environment as a means of satisfying specialized communications requirements in a world of changing technologies. That decision was taken against the background of the FCC's "computer inquiry," which concluded that telecommunications today is characterized by new developments in technciogy which create new demands that cannot be adequately served by monopoly carriers.

The fundamental rationale of the *MCI* decision was that while there is some overlap between the services that specialized carriers wish to provide and those provided by monopoly carriers, the adequacy of established carriers to meet future requirements should not be the determining factor in deciding whether competition should be allowed. Underlying this decision was the notion that competition will produce newer, or at least better, services than monopoly will, and that when regulated industries are vital to the national welfare, competition is especially important.

In addition, according to Mr. Strassburg, the commission held that regulators should not be overly concerned about whether specialized carriers will "cream-skim" the services of monopoly carriers, because specialized carriers are entering a field where the market is expanding and where there is a great need for new service. The commission noted that where competition in a market warrants departure from rate averaging, it would not oppose that departure, assuming that the resulting rate-making principles were sound. Subsequently, the logic favoring competition in specialized terrestrial carriers was extended to domestic satellites. In summary, Mr. Straussburg said, the commission in the *MCI* decision decided that in formulating its rules regarding common carriers, economies of scale should be matched against economies of diversity.

Mr. Straussburg commented that he did not think that the objectives of the MCI decision have yet been fully realized. He said that the commission could not have anticipated in 1970 all that has happened since, including extensive litigation and a recession. Mr. Straussburg observed that it is premature to expect that new services and markets will be fully developed such a short time after the *MCI* decision, but he believes that there is a gradual growth in the direction of innovation. Nevertheless, the specialized common-carrier market is still very small, with only about 25 million dollars of gross revenue in 1975. Mr. Strassburg is convinced that the industry will continue to grow, unless pending federal legislation makes competition with the Bell System more difficult.

Dr. Johnson reviewed the points made in his paper and then commented briefly on the dangers he sees ahead in the specialized common-carrier field. He said that if the FCC wishes to permit competition in this field, as it apparently does, it must realize that it cannot continue to regulate along classic public utility lines. In particular, the commission must be willing to see firms go bankrupt if they cannot compete effectively. This would be a fundamental departure from the past. In addition, the FCC must move away from supporting "umbrella pricing" and toward supporting pricing on the basis of long-range incremental costs. These costs are hard to define and to determine empirically; but even if only crude measures are used, they are a better basis for pricing than the criteria the FCC has applied in the past.

Dr. Johnson said that he doubts that cartelization in the domestic common-carrier field is a major danger in the near future. He believes that there is increasing competition and turmoil in the common-carrier industry and that in this respect it is taking on the character of other American industries. With increasing competition, however, the FCC and the courts face a greater administrative burden. Unless administrative procedures can be streamlined and uncertainty on the part of industries can be reduced, there is a danger that capital may be reluctant to enter the specialized carrier field. Dr. Johnson concluded that, on the whole, he thinks competitive pressures are healthy in the specialized carrier field.

Dr. Roberts began by reviewing the growth of national data networks, with the aim of showing the effects of competition on communications common carriage. He said that since the early 1970s, many countries have been considering how to develop national data nets. Data transmission on a national basis has become important even to AT&T in this country, because it believes the data market will at some time in the future become larger than the voice-transmission market. In the United States, there are now two public switched on data nets—Datran and Telenet. There are also two in Canada, and other countries are following, with France and Germany hoping to establish systems by 1978.

The United States leads the world in data nets, and Dr. Roberts believes that this is due to our competitive environment. The public data function in this country is growing rapidly, but changes may be ahead as the Bell System becomes interested in the field. Their massive economic resources could overwhelm competitors.

Dr. Roberts reviewed figures on the potential market for data processing and for data terminals. He commented that terminals are not strictly in the communications environment and that terminal supply is totally competitive. He also said he believes that since the FCC's computer inquiry, the distinction between data processing and communications has become increasingly clear. Recent decisions by the CCITT have clarified the situation further, and it seems now that there is a communications industry growing up that is not primarily devoted to transmission.

Dr. Roberts then turned to the notion of a "carriers' carrier," which has been suggested as a remedy for some problems in the specialized carrier field. He began by commenting that his company, Telenet, leases all of its lines from AT&T. A large part of the company's costs is in local loops. The company could probably create its own local loops, but AT&T's are satisfctory. The problem ahead, he said, is that if AT&T itself enters the value-added carrier business, it could, for internal accounting purposes, price the cost of local loops to its specialized carrier division much lower than to independent competitors.

As a remedy for this problem, Dr. Roberts suggested that if AT&T wishes to compete in the value-added carrier field, it should be required to establish a subsidiary which would be financially and administratively separate from the rest of the company. This subsidiary could offer competitive services while leaving monopoly services to the mother company. AT&T could then sell transmission facilities to its own subsidiary and to other value-added carriers on a tariffed basis, but it would not be allowed to discriminate in favor of the subsidiary. Although there might be some economies obtained

by joint physical operating arrangements, Dr. Roberts said that when independent companies are buying 25 percent of AT&T's data-transmission capacity, AT&T would want to maintain their patronage and would not adopt unrealistic pricing.

Dr. Roberts said that, in effect, this kind of separations arrangement would make the Bell Long Lines Division a "carriers' carrier." Long Lines would provide transmission facilities to other carriers, but it would not itself engage in competitive activities. Dr. Roberts said that although there has been considerable talk about a "carriers' carrier," there has been too little effort to inaugurate such an arrangement. He argued that if the situation continues as it is, AT&T will eventually enter the value-added carrier field with the advantages of cross-subsidies from other parts of its operation. While regulators might try to prevent those cross-subsidies, they have, to date, had little success in doing so in other common-carrier areas.

The answer, Dr. Roberts said, is to separate functions within the Bell System entirely, rather than to try to prevent cross-subsidies by accounting techniques. This kind of separation, he said, has been accomplished in the satellite field, and it can be accomplished in terrestrial transmission as well. He concluded by observing that such an arrangement might even be beneficial to AT&T, and that many people at Bell Canada believe the arrangement has been advantageous there.

## GENERAL DISCUSSION

The discussion which followed the three presentations centered primarily on the idea of a "carriers' carrier" advanced by Dr. Roberts. Two notions of the "carriers' carrier" emerged. The first was that AT&T should be able to compete in value-added services; but if it wishes to do this, it should be required to spin off an entirely separate subsidiary, with separate accounting, plant, and staff. This subsidiary would purchase from AT&T the transmission facilities it needed, and these facilities would be offered by AT&T both to its subsidiary and to other firms interested in entering the value-added field at the same price.

An alternative notion of the "carriers' carrier" was that in addition to spinning off a subsidiary which would compete in the value-added market, AT&T should spin off its Long Lines Division as a separate subsidiary to compete with MCI, Datran, and other specialized private-line carriers. This second notion of a "carriers' carrier" received much less attention than the first, and numerous objections were raised against it. Several participants pointed out that it is difficult to separate out Long Lines' cost and facilities from the local loop costs and facilities which, almost everyone agreed, must remain as monopoly services. As a result, the task of allocating costs in regulating AT&T would be as difficult if Long Lines were spun off. In addition, one participant contended that Long Lines subsidizes local loops and that if the two services were separated, local loop costs, which are the major component of transmission costs to value-added carriers, would escalate dramatically.

Against these views, it was argued that no firm should be allowed to offer both monopoly and competitive services. Participants who took this view said that a separation between these two kinds of services was economically most efficient and regulatorily optimal. As a result, they believe that as long as there is competition in Long Lines transmission, AT&T should be required to have a separate subsidiary which would handle that part of its business. It was also noted, however, that even local loop service could, at some point, become competitive, with value-added carriers making use of cable television, or even buying their own copper pairs. Although neither of these options seems to be economically sound at the present time, the possibility that they might become so suggests that there is no particular reason to say that Long Lines should be separated from AT&T simply because it is competitive.

Four major questions were asked about the notion of a "carriers' carrier," which was defined as a Bell subsidiary offering entirely value-added services. First, participants asked what would happen if, under this arrangement, AT&T decided to take a fundamentally anti-competitive attitude. It could do this, for example, by using its subsidiary as a "loss leader," either by under-pricing its services or by artificially inflating the cost of transmission facilities to value-added carriers. This would allow AT&T to take advantage of its vast economic resources to drive competitors out of the value-added field. Participants asked how AT&T could be prevented from doing this and how its subsidiary could be monitored after a separation, even if regulatory remedies for anti-competitive activities were available.

To these questions other seminar participants replied that, given an appropriate separation between the mother company and its subsidiary, AT&T would not be able to subsidize its value-added services. In their view, the separations arrangement would make it easy to determine whether AT&T was subsidizing its subsidiary, because separate books would be kept which would show clearly whether it has adopted an anti-competitive attitude. If abuses appeared, regulators could take appropriate steps. Problems of regulation and monitoring would not entirely disappear, but they would be considerably diminished by separating the subsidiary from AT&T in every possible way. It would no longer be necessary, for example, to allocate costs on the basis of some accounting formula between different parts of AT&T.

The second question raised about the "carriers' carrier" arrangement was whether a separation between AT&T and a value-added subsidiary would, in fact, solve problems of regulation or simply raise old problems in a new form. Participants who were concerned about this difficulty noted that in any subsidiary arrangement, there would be some economies incurred if the AT&T subsidiary, for example, shared physical facilities with other parts of the Bell System. In addition, AT&T's resources might make it possible for the subsidiary to be large enough to incur substantial economies of scale. In either case, a strong argument might be made for AT&T selling its transmission facilities to its subsidiary at a discount.

Such an arrangement would raise questions about what kind of discount was appropriate and how such economies as sharing of a physical plant would contribute to meeting costs. These are the same kinds of problems which the FCC now faces in regulating AT&T. Using this line of argument, some participants suggested that perhaps regulators should forget about the creation of a separate subsidiary as a remedy for problems in the common-carrier field and concentrate, instead, on the continuing problems of pricing policy and cost separation. Participants who took this point of view also argued that the problem of cross-elasticity of demand and its impact on pricing would still occur regardless of whether a "carriers' carrier" arrangement was adopted.

Participants who disagreed with this view suggested that if the putative subsidiary were separated in the correct way from the Bell System, problems of pricing policy would not be great. They did not believe that the economic advantages of shared facilities were substantial, and they pointed out that in a proper separations arrangement, volume discounts would be passed on to other buyers in the same way that they would be passed on to the AT&T subsidiary. If there were some misallocations of costs, everyone, including the AT&T subsidiary, would suffer equally. With regard to cross-elasticities, the seminar participants said that value-added services and the transmission facilities they require are novel enough that cross-elasticities will not be significant in the near future.

The third question raised about the "carriers' carrier" notion was whether it would, in fact, lead to economically and socially optimal pricing. Some participants suggested that if the AT&T value-added subsidiary must compete on an equal basis with other value-added carriers, it would be foregoing considerable economies of scale which might, if allowed in the calculation of prices, considerably reduce the cost of data transmission. Although a market structure containing a "carriers' carrier" would

probably bring down prices to a competitive level sooner or later, that competitive level might not be the lowest feasible price. It was argued that perhaps a cross-subsidized price is more appropriate, and that the notion that all firms in the value-added field should compete on an equal basis might be too narrow a definition of equity.

Arguing against this position, some participants pointed out that it summarizes AT&T's traditional thinking. They said, however, that in its decision to allow specialized carriers, the FCC had specifically opted for economies of innovation over economies of scale. They argued that the commission was right to hold that in a field where the market is growing quickly and new technologies are being introduced at a rapid rate, economically and socially optimal prices are most likely to be achieved through competition, which encourages growth and innovation, rather than through monopoly, where firms may have little incentive to reach the lowest possible price through aggressive market development and technological innovation.

A fourth problem raised by one participant about the "carriers' carrier" notion was that competition in other communications markets has been tried and has not succeeded. The participant cited the example of competition between the Postal Telegraph Company and Western Union. In this case, Postal Telegraph failed and Western Union absorbed it. The participant also cited the example of international cable traffic, where, he said, a cartel arrangement has emerged.

Against this view, other participants said that the telegraphic analogy was not appropriate. In that case, the industry had a high fixed cost and declining demand as alternative telecommunications modes emerged. However, some participants felt that the analogy to international cable traffic was interesting. There, economies of scale are substantial, but the FCC has decided that it is important for all carriers to have access. Strictly on these terms, however, the analogy is not so apt to the present fully developed domestic telecommunications system as it is to the growing system in the 1930s. Today, modern technologies allow increasingly low unit costs, but because of the volume of traffic, duplicate facilities have become economically viable. As a result, the experience of the international cable business could be said to support the introduction of competition.

The participants also argued that the industry and the FCC have developed policies in the international cable field which discourage a fully competitive environment. Among those policies are arbitrary rules for assigning traffic to particular carriers and 'gateway" requirements. This has not yet led to complete cartelization, but it has created vested interests, and the FCC is under powerful pressures to maintain these interests in the international field. Unless it is fully committed to competition and is willing to see some firms go bankrupt, the FCC will have to face the fact that full cartelization can develop. Participants warned that similar problems of vested interests can develop in domestic communications unless the FCC has a full commitment to competition. Other participants qualified these comments by saying that, in fact, there never was a competitive international market. But they, too, felt that the FCC faces critical tests domestically.

Two final points about the "carriers' carrier" notion were discussed briefly. First, one participant asked whether possessing Bell Labs would give AT&T a unique competitive advantage in establishing a separate subsidiary. Another participant replied that Bell Labs is not dealing with many of the research and development questions particularly appropriate to value-added carriers, that there is a great deal of research conducted in this field outside the Bell System, and that perhaps arrangements could be made to make the work of Bell Labs more broadly available. Second, a participant asked why, if AT&T were forced to spin off a subsidiary in order to enter competitive fields, it should choose to go into the value-added carrier business at all. Why, for example, shouldn't it go into gas stations? Other participants answered that the value-added field is a growing market and would be a good investment for anyone, including Bell.

## FOOTNOTES FOR CHAPTER III

1 The author gratefully acknowledges the support of the John and Mary R. Markle Foundation to Rand's Communications Policy Program in the preparation of this paper. The views expressed are the author's own and are not necessarily shared by Rand or its research sponsors.

2 *Microwave Communications, Inc.*, 18 FCC 2d 953 (1969); *Specialized Common Carrier Services*, 29 FCC 2d 870 (1971); *Second Report and Order*, 35 FCC 2d 844 (1972); and *Memorandum, Opinion and Order on Reconsideration*, 38 FCC 2d 665 (1972). In addition, the FCC's *Carterfone* decision in 1968 (13 FCC 2d 420) permitted, under certain conditions, the interconnection of customer-provided terminal and station equipment with the telephone network. The competitive effects of interconnection are also very important for the future development of the industry. However, they fall outside the scope of this paper.

3 FCC Docket 20003, *In the Matter of Economic Implications and Inter-relationships Arising from Policies and Practices Relating to Customer Interconnection, Jurisdictional Separation, and Rate Structures*, Notice of Inquiry, 46 FCC 2d 214 (April 10, 1974).

4 System Applications, Inc., *Regulatory Policy Changes in the Future of the Independent Telephone Industry*, January 1976, pp. i-27.

5 Walter R. Hinchman, "Developments in Data Services and Products"; remarks before Interface '76 Data Communications Conference, Miami Beach, Florida, March 31, 1976.

6 American Telephone and Telegraph Company, "The Crisis in Telecommunications; Discussion and Proposed Resolution," mimeo, New York, undated.

7 Address by Richard E. Wiley before the 87th Annual Convention of the National Association of Regulatory Utility Commissioners, Boston, Massachusetts, November 3, 1975.

8 A profit-maximizing monopolist, operating with constant marginal costs and facing a linear-demand curve, would reduce prices by *one-half* of whatever marginal cost reduction is afforded, either through lowered telephone rates or through other factors that reduce its costs of doing business. When a few firms are competing as oligopolists, the theoretical analysis is more complicated, but it would remain generally true that cost reductions would be passed on at least in part to consumers. Under conditions of "pure" competition, involving very large numbers of firms, the proportion passed on would depend in part on the price elasticity of demand facing the industry.

9 As quoted from *Telecommunications Reports*, April 19, 1976, p. 36.

10 Without elaborating here, I have argued in another paper that this line of reasoning is incorrect and that, on the contrary, it may be socially beneficial for satellites to compete for both short and long-distance traffic. This discussion is contained in my comments on a paper by Kenneth B. Stanley, "Pricing of Satellite Services in the International Telecommunications Industry" to be published in Harry Trebing, ed., *New Challenges in Public Utility Pricing*, forthcoming.

11 *Specialized Common Carrier Services*, 29 FCC 2d 870, at 906(1971).

12 American Telephone and Telegraph Company, "The Crisis in Telecommunications."

13 Richard E. Wiley, address before the United States Independent Telephone Association, Dallas, Texas, October 16, 1975.

14 Arthur D. Little, Inc., *The Relationship Between Market Structure and the Innovation Process*, January 1976, p. 1.

15 This $30 million figure is an approximation made by the FCC's Common Carrier Bureau on the basis of the "Form P" that is required to be filed annually by the specialized terrestrial common carriers. This figure does not include the revenues of carriers using satellites, because, at this writing, they are not required to report in the same format.

16 MCI Communications Corporation, *1975 Report to Stockholders*, June 6, 1975.

17 Satellite Business Systems, application before the FCC, December 1975.

# IV.
# PUBLIC SERVICE USES OF NEW COMMUNICATIONS TECHNOLOGIES

*by*

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*and*

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**Commentary:**

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## PREFACE

These papers by John Witherspoon and J. David Roessner were presented at a seminar conducted by the Aspen Institute's Program on Communications and Society in Washington on June 16, 1976. The subject of the seminar was "Public Service Applications of New Communications Technologies." Mr. Witherspoon addressed the problem from the standpoint of an expert in telecommunications applications, and Dr. Roessner spoke from the broader perspective of a student of technological innovation in the public sector.

Along with the presentation of the papers, there were comments by Albert Horley and a general discussion by the seminar participants, who included researchers, interested members of the public, and representatives of both private industry and a variety of federal agencies. Summaries of the comments and the discussion are included here.

F.C.

## STAKING THE PUBLIC SERVICE CLAIM TO NEW COMMUNICATIONS TECHNOLOGIES

*by John P. Witherspoon*

It has become commonplace to say that technology runs ahead of our ability to use it. That seems to be true even when many responsible people agree that a given technological development holds real promise for rendering better services, or service at less cost, or both. A critic might say that to adhere to the old ways, to ignore the advantages which are generally apparent, is simply bad management. Such a critic could observe that public services do, after all, have the money. Education, for example, accounts for more than seven percent of the gross national product; its annual budgets are on the order of $110 billion. The fault, therefore, must lie in bumbling administration or bureaucratic inertia—or so it would seem unless one looks more closely at the facts of the case.

To illustrate these facts, as they appear to me, let me draw two examples from the 1974-75 experiments in health care and education which were conducted using NASA's ATS-6 satellite. In the year before ATS-6 was dispatched to India, a large number of experiments were conducted in Appalachia, in the Rocky Mountain States, and in Alaska. In all of these experiments, the communications technology itself was superb, and the health and education communities learned a lot. However, in the Rocky Mountains experiment, in which a number of junior high schools in remote communities had an opportunity to use instructional television transmitted via the ATS-6 satellite, the service simply stopped when the ATS-6 project went off to India. The small satellite receiving stations are still in place, but it is unlikely that they will be used again by the junior high schools when the satellite returns, and there has been no attempt to keep the service going by other means.

In Alaska, where the ATS-6 linked a number of remote community health clinics with a distant professional hospital staff, the state of Alaska worked with RCA to provide operational satellite service to the state after the ATS-6 project ended. The lessons learned with ATS-6 clearly influenced the course of that statewide development, and the Alaska Federation of Natives has stated plainly to the governor's office that the most important use of the new system will be to provide communication links for village health care.

In terms of immediate effect, then, one experiment simply ended, and the other became a profound event in the development of health care in Alaska. What are the differences between the two projects?

We might stipulate at the outset that the village clinics of Alaska may have needed their satellite service more urgently than the Rocky Mountain village schools needed theirs. It can be demonstrated that ATS-6 helped save lives in Alaska. But that can't be the whole story, because a great many schools throughout the United States have been using instructional television for nearly 25 years; and among practitioners in that field, it's a truism that small rural schools with limited resources are generally the first, most fervent, and most loyal of school television users. So let me concentrate for a moment not on program substance but on structural arrangements—on what the agents of change had to work with in each case. While these examples concern satellite projects, you will recognize that the lessons apply to a great many other areas of technological innovation as well.

The project in the Rocky Mountain schools was brief, lasting only for several months. The experimenter was the Federation of Rocky Mountain states, which was only loosely connected

to the schools themselves. With limited exceptions, the school budget process was not involved in the experiment. School people were involved in the selection of material to be transmitted, but they didn't vote with their dollars.

By contrast, the Alaska native health project was a logical step in an existing chain. When ATS-6 arrived, the villages were already using the earlier ATS-1 for voice communications. Prior to that, they had struggled with HF radio. The village clinics were related to the Native Health Service, so that an infra-structure was in place for budgeting and program coordination. And when the experimental year was over, the organizational infra-structure was still there, ready to proceed with the next steps. Furthermore, because of the unusual problems of climate and terrain, no ubiquitous, satisfactory telephone service has existed in Alaska. It was a natural market for satellite service; the new technology was a clear answer to obvious problems. Medical people in Alaska don't yet have the system of their dreams, and, in fact, they hope to use ATS-6 again upon its return. But a major example of technology transfer is available any day in the Alaskan bush.

I believe that this technology was readily adopted in Alaska for several reasons. The need was obvious and the response was clearly defined. The organizational infra-structure was in place, with staffing and budget lines already established. No personnel were threatened; the technology allowed everybody to come out ahead. Finally, the cost alternatives were such that satellite applications represented a clearly beneficial trade-off.

If any enterprise is to apply any new technological development broadly and systematically, by definition it must do so consciously. There must be a decision-making structure able to implement the system. But education, for example, has no such structure. It is not an exaggeration to say that there is no such thing as *an* American system of education. Basic decisions are made at the level of the school district or the individual university campus. The largest effective decision-making unit is the state. Federal participation in educational totals about 11 percent of education budgets, and with a few exceptions, federal agencies are constrained by custom, law, and the political process from exerting substantial leverage on education in any monolithic sense.

As a result, there exists a classic marketing problem. An administrator in education—at whatever level he works—is likely to spend very little time thinking about future communication requirements, because he knows that his sphere of influence is small in affecting the whole. The supplier of communications services, though his intuition may speak to him about multi-million dollar markets, knows that there is no real handle on the situation. The notion of *an* education market is an illusion.

The result, then, is a very dampening effect on change. Because of a diffuse decision-making structure, it's hard for either potential buyers or potential sellers to assess demand for relatively complex services, and this in turn affects the supply of such services. The seller's response to this situation is to shape his product or service to markets in which he can identify specific buyers. He sells hard to these identifiable customers, and he markets the same products as best he can to public service.

The Public Service Satellite Consortium was invented by state and private public service agencies and by OPT, HEW, and NASA to wrestle with this situation. It is essentially a market mechanism. For the buyer, it will provide a way in which decision makers from diffuse systems of public service can aggregate their requirements and resources to their mutual benefit. For the seller, it provides an entry point into a difficult market. Furthermore, as the consortium matures, it can identify services that *ought* to be rendered and back up its statements by identifying specific markets for such services.

With an operating history of eight months, it woud be foolish to believe that we have solved the problems of public service market aggregation. However, we are approaching the question, and I can announce a first major response. Our method is to work simultaneously on the service requirements of users, the technical potential of technology, and the economic and organizational factors of its use. In working with users, we rely much more on personal contact than on questionnaires. We see ourselves as the middle of a big conversation, an iterative process involving user requirements, technical potential, costs, and structure.

Let me describe our first venture in pursuing the mission of aggregation. At its meeting of May 24-25, 1976, the Consortium Board authorized the staff to pursue the feasibility of a satellite-based network for postgraduate continuing education. During a series of *one-on-one* meetings with members during the past four months, continuing education—particularly for groups such as physicians, engineers, teachers, and industrial managers—was the requirement most frequently stated. We will now proceed to see whether we can aggregate these requirements into a cohesive service or, more properly, a cohesive set of technically compatible services. We'll be talking in detail with carriers and suppliers, and with those who want to provide the services. The consortium is not a program production agency, but it will be concerned with making facilities available to public service users at affordable cost.

As you might expect, an area for particular exploration is that of delivering the instruction to the end user, the student. Our assumption is that most student groups will be too small to make substantial use of broadcasting, including public broadcasting. But that still leaves open such delivery modes as cable systems. And what about the hotel chains which are beginning to explore the use of small earth stations for their own purposes, or the ITFS or MDS relays to educational institutions, industrial plants, and other existing faciities? As we learn more about the feasibility of small, low-cost earth stations for local reception and distribution, we can explore placing them directly in community clinics and hospitals, in industrial facilities, in schools and colleges, or in libraries and community centers.

We don't anticipate waiting for the next generation of satellites before we start on this idea. We are interested in talking with present carriers about their present systems, even while we maintain a keen interest in the prospects for the future. We hope the result of our work will be an integrated series of video distribution networks, using telephone return links as required. We'll be looking for maximum economies of aggregation in satellite access, in transponder use, in satellite reception, and in final distribution to the end user.

Can we make it, economically or technically? We won't know for several months, but we're going to give it a hard try. In considering the long-range application of new technology to public service, I suppose it's fair to say that this consortium majors in aggregation, in planning, and in providing technical support services. However, there are other considerations. I've touched on some of them, but let me summarize in this context:

1. Most public service organizations don't have adequate capacities for internal research and development or for long-range planning with regard to the ways in which missions are performed.
2. The federal government has attempted to assist through the programs of such agencies as NIE, NIH, NSF, aspects of NASA's work, and others. But the diffuse decision-making structure of these public service agencies makes it very difficult to establish linkages between the research or plan and its operational, day-to-day application.
3. The budgetary systems of these federal agencies, often set by law, do not have enough flexibility to deal with change easily.
4. A great many public service agencies are labor-intensive, and the ground rules of law and

custom are that the "flexible" parts of the budget tend to be in non-personnel areas. Personnel costs in education, for example, constitute about 70 percent of the budget. Capital costs, maintenance, fuel, supplies, and instructional materials and services are all in the last 30 percent.

If technology is to be used effectively in public service, then, it's necessary to start with an early marriage between the technological idea and the aggregated requirements of users. The new piece of technology must be marketable, whether through a mechanism like PSSC or directly to users. The process of adoption by the users will take time, because the organizational and budgetary arrangements are both hard to change. This adoption, or technology transfer, must generally begin on a low-threat basis, with minimum immediate impact on local budgets. But from the beginning, a clear process must be established by which, if stated criteria are met, the service will be offered on a regular basis at a defined cost which, in most cases, should be tied to regular operating budgets.

In summary, when considering the difficulties of applying communications technology to education, health, or other public services, simple exasperation doesn't help. In our quest for individuality and local control, we Americans have created systems in which coordinated decision-making is very difficult. On balance, we probably prefer local control to coordinated decisions, and so we need to concentrate on mechanisms which make it possible to effect change in response to common requirements and within the context of local control. The Public Service Satellite Consortium is one such mechanism.

## BARRIERS TO THE ADOPTION OF NEW TECHNOLOGIES IN PUBLIC SERVICE AGENCIES

*BY J. David Roessner*

In this paper, I would like to address two questions: Why have new communications technologies not been readily adopted for public service applications? What can be done about it? I suggest that there are three possible answers to the first question:

First, the public sector is inherently resistant to change, whether because of bureaucratic inertia, or because the public market is too disaggregated, or because the communications infra-structure is either ineffective or nonexistent. Second, the new technologies being offered to the public sector are simply not cost-effective from the user's point of view. And third, commercial interests are unwilling to undertake the risks involved because insufficient market-related information has been developed. Let us consider these possibilities.

### An Inherent Resistance to Innovations

There seems to be what might be called a "demand" problem in the public service sector, and one explanation for this problem is simply the nature of a bureaucracy.

***Bureaucratic inertia.*** A recent publication of the Committee for Economic Development cited this example of the bureaucratic process:

Inglewood, California, has used one-man refuse trucks for more than a decade at significantly reduced cost and with fewer injuries and with greater satisfaction for personnel. Informed of the one-man trucks, the sanitation director in an Eastern city using four men to a truck said he did not believe it.

Having confirmed that they were in use, he opined that the Inglewood streets and contours were different from his city's. Convinced that conditions were generally the same, he lamented that his constituents would never accept the lower level of service. Persuaded that levels of service were equal, he explained that the sanitation men would not accept the faster pace and harder work conditions. Told that the Inglewood sanitation men prefer this system because they set their own pace and suffer fewer injuries caused by careless co-workers, the director prophesied that the City Council would never agree to such a large cut-back in manpower. Informed of Inglewood's career development plan to move sanitation men into other city departments, the director pointed out that he was responsible only for sanitation.

Is there reason to expect the public sector to be less innovative than the private one? The answer appears to be "theoretically, yes; in practice, maybe." Economists are generally concerned with the comparative efficiency of the two types of organizations, public and private. They have explored the theoretical implications of market competition for efficiency, and they argue that the absence of the competitive environment in public organizations means that public organizations are less efficient, less responsive to demand, and less innovative than private ones.

Political scientists and public administrators tend to agree, pointing to several features of public organizations that make them unique. One such feature is the lack of a high degree of control by top executives, which is the result of political appointments and the multiple-appeal routes available to personnel under the executives. This means that the uncertainties associated with innovation are less likely to be tolerated by organizational members and by the heterogeneous client groups of public agencies.

A second factor is the lack of clarity in goals and in measures of effectiveness in public organizations. Public organizations are likely to favor highly visible but superficial change over long-run changes in performance. They also seem unable to evaluate or assess innovations easily. As examples of the latter point, one might compare two applications of the ATS-6 satellite. In the Alaska health-care use of the ATS-6, an obvious measure of the impact of the technology was the saving of lives. In the case of the Rocky Mountain schools, it remains unclear whether the satellite affected educational performance, largely because no one can agree on how to measure adequate educational performance.

A third unique feature of public organization is the short terms of office and the high turnover rates in leadership positions. Public officials need to demonstrate immediate results, which leads to an emphasis on quick payoff and low-risk programs over innovative ones. What evidence exists for these characterizations of public agencies? Findings of studies on the efficiency of public and private organizations are mixed, and there is almost nothing on their relative innovativeness. However, there is some evidence that rates of diffusion among technologies—once they are introduced—are similar in the two kinds of organizations.

***A disaggregated public market.*** The "inherently non-innovative" character of the public sector may also be explained as a "supply" problem. That is, firms supplying new technologies are simply not responsive to public markets. The reasons may be higher marketing costs, the disaggregated market, the fact that the products or services are spin-offs from private markets, the intricacies of local procurement regulations, or even outright graft. Again, however, there is slim evidence as to whether the supply problem is in fact a problem.

In the highway field, there is considerable evidence of aggressive firms successfully marketing products and services to state highway departments. Similarly, in education there is a great deal of successful marketing of curriculum materials, with heavy research and development inputs by the Office of Education, the National Institute of Education, and the National Science Foundation. In health care, there is evidence of widespread adoption of new medical technologies—perhaps even some "over-innovation" due to the peculiar characteristics of this market. Police departments make considerable use of spin-off technologies, and fire services are supplied with products from a large number of competitive, though financially weak private firms. Finally, there is evidence that city needs and priorities vary widely and post important limits to any market-aggregation strategies by private firms. The general conclusion is that there is no pervasive supply problem for the public sector. In some service areas, there may be a problem; in others, there is none.

***An ineffective communications infrastructure.*** Bureaucracies may be resistant to innovation because the members of what might be called the "innovation system" in our society are poorly integrated both among themselves and with the public sectors. By "innovation system," I mean the research and development people, the financiers, the producers and distributors, the regulators, and the buyers and users—in short, all those actors and institutions which influence the process of innovation from the generation of an idea through purchase and use. The nature of this innovation system varies widely among technologies and among potential users in the public market. For example, the strength of professional associations concerned with highway construction is well-known. In the air-pollution field, such associations are relatively weak. There is an active grapevine among fire department officials for transmitting evaluative information on new technologies, but in education, this system of information is not very effective.

**A Lack of Cost-effective Products and Services**

New communications technologies have not been readily adopted for public service applications at least partly because technologies are not cost-effective from the user's point of view. In effect, the producer or supporter of innovative products and services for the public sector has failed to conduct adequate market analysis. There is already considerable evidence from studies in the private sector that what might be called "demand pull," or market-related factors are significant in explaining the success and failure of commercial innovation. We are beginning to see similar evidence from recent studies of research and development management in federal civilian agencies. Almost invariably, the successful projects are more likely to have had market analysis performed at early stages in the research, planning, and project-selection periods than projects which have had no such analysis.

For example, a joint NASA/National Science Foundation demonstration in four California cities set out to prove that if former aerospace engineers were introduced into the offices of city managers, they would be useful in helping to resolve city problems. The demonstration was well-researched and planned; it was also very successful. As predicted, the re-employed engineers became valuable public servants, *not* through their knowledge of aerospace technology, which had little applicability to their city jobs, but rather through the contribution of their managerial and analytic skills. In contrast, another illustrative project involved the marketing of aluminum ladders to fire departments. Engineers for the manufacturer argued that aluminum ladders were lighter, stronger, and more resistant to rot than wooden ones. What they failed to consider is that aluminum ladders conduct electricity and thereby created a serious hazard for firemen in cities with overhead wires. There is a lesson in both of these examples: The mere existence of advanced technology offers no assurance that the technology will be useful in meeting specific public service needs.

**An Insufficiency of Market-related Information**

Commercial firms interested in developing and marketing products and services to the public sector must have information about the need and the desire for their products and services before they can begin to risk capital in research and development efforts. Here, we need to distinguish between information on *technical feasibility* and information on *marketability* and *demand.* A recent RAND study of 24 Federal demonstration projects identified five dimensions of information related to these projects. A demonstration is a "success" with respect to the information it provides if it reduces uncertainty in each of the following areas: (1) *technology*—the feasibility of a technology for a particular use; (2) *costs*—the cost of manufacturing or operating a process; (3) *institutional effects*—the impact of the new technology on the structure, functioning, and external relationships (especially unions) of the potential user; (4) *demand*—the benefits, both public and private, to be gained from the use of the new technology; (5) *externalities*—the safety, pollution, and health hazards of the technology.

The public sector may or may not be inherently less innovative than the private one, but clearly it is *different.* Unlike private industry, the public sector must reckon with institutional constraints, such as accountability to external groups, with a lack of common technical needs, and with a lack of agreed-upon performance criteria. (The latter characteristic is especially a problem in education.) In addition, there is considerable evidence that federal agencies, in particular, have pushed new technologies on the bureaucracy without giving adequate attention to market and demand factors.

In consideration of all these factors, and since there seem to be no common features of public service innovation systems that would permit generalized strategies, I would suggest that, at least for the immediate future, technology-deployment strategies in the federal agencies need to be worked out on a case-by-case basis. I would also suggest the need for greater sensitivity among public policymakers to the unique features of public organizations at the state and local level. Finally, I suggest that there be far greater use of market analysis in selection of research and development projects by federal agencies.

## COMMENTARY

Dr. Horley augmented the presentations of Mr. Witherspoon and Dr. Roessner by raising one additional consideration about new communications technologies: These technologies, he said, have problems of scale not found in most other areas of the public service sector, in that their applications are high-risk, high-cost ventures, especially when compared to more conventional health and education projects, such as the development of textbooks. If projects of this sort are to go ahead, steps must be taken both to lower the costs of failure and to ensure that public service organizations can justify the reasonableness of their risk-taking.

To accomplish these goals, communications projects require a constant level of investment, and Dr. Horley believes that it is reasonable to look to the government for this. He cautioned, however, that if government is to become involved, it must engage in careful market analysis of the contemplated systems. And he stressed that the worlds of private enterprise, of the federal government, and of local social service systems should not be separated in the development of novel telecommunications applications. The strengths of all three should be combined in new institutional arrangements and strategies for funding. In particular, Dr. Horley endorsed federal, local government, and private industry partnerships, with a constantly diminishing federal contribution that would ensure either eventual self-sufficiency for the new systems or a rational decision to terminate

unsuccessful ventures.

## GENERAL DISCUSSION

Participants at the seminar raised four problem areas not discussed at length by the speakers. First, there were questions about whether the problem of aggregating demands for new services is, in fact, likely to solve major problems standing in the way of the implementation of these services. For example, cable television applications have not raised significant aggregation problems; yet despite extensive demonstration projects in the cable area, public service projects have not caught on. The seminar participants suggested that solving the aggregation problem is simply a threshold issue that prepares the way for dealing with other difficulties.

The second problem identified by the seminar participants is the immense amount of governmental and private red-tape involved in launching social service projects. Scores of separate pieces of federal legislation, multiple levels of local bureaucracy, and many complicated regulations by private companies (such as Blue Cross in the health field) raise problems of reimbursements, licensing, and interpretation of rules that must be resolved before projects can go ahead. This leaves the project manager with the choice of either working out *ad hoc* solutions in one locale and then finding the solutions difficult to replicate, or taking on the larger problem of reforming supervisory organizations and then finding the task impossible to handle.

A representative of the Department of Health, Education and Welfare said that while his agency is not yet coming to grips directly with the red-tape difficulties, it is becoming increasingly aware of telecommunications opportunities. For example, the Assistant Secretary for Education has asked all bureaus to indicate how they expect to fit telecommunications into their overall plans for the next five years. It is possible that as an awareness of technical options grows in HEW, more rational management of social applications will result.

The seminar participants identified a third problem area by suggesting that although a great deal of emphasis is placed on the potential of new technologies to provide social services via video, it is quite possible that audio is perfectly adequate for most purposes. This observation resulted from comments that audio has been found to be as effective as video in many tele-medicine experiments and in British research on tele-conferencing. Since audio is so inexpensive, one participant wondered whether the current emphasis on video applications is justified.

We already have a perfectly satisfactory world-wide audio system in the form of the telephone network, and if new technologies can add only video to that system, it is questionable whether they can make a worthwhile, or at least cost-effective contribution to social service delivery. Several participants expressed sympathy with this view, while others argued that it is too soon to evaluate video applications, and that even if they provide only marginal advantages, they may still be worthwhile. In addition, it was pointed out that American companies dealing in tele-conferencing services have found that potential clients are extremely interested in making use of video.

As a fourth problem area, several participants suggested that the failures of social applications of new communications technologies may indicate that those technologies are a solution in search of a problem. They suggested that perhaps the best thing to do is simply to allow the free market to evolve technological applications as they become cost-effective, rather than to have government promote them through research and development or investment. Other participants observed

that in private industry, the procedure of first developing a product and then looking for its application is sometimes highly successful. One participant argued that the creativity of the potential user should not be underestimated. In an area of rapid innovation, it may be necessary for people to become acquainted with the technology over a considerable period of time before applications are apparent, although those applications may be significant in the long run.

Finally, several participants expressed their conviction that in the high-risk communications field, the federal government might appropriately undertake the large and difficult job of developing social service systems. This does not mean that government should try to solve all social problems. It does mean, however, that the federal government could finance major technical advances with a potential for social benefits, such as the development of satellite technology. The federal government also has a proper role in operating on the margins of privately developed systems in order to create the conditions within which other levels of government and other private companies can begin to solve social problems.

In addition to raising these difficulties, the seminar participants added to the list of criteria for the successful application of technological systems outlined by the speakers. They pointed out that a well-perceived need for a certain social service was a characteristic of most of the successful satellite projects, such as the Alaska health-care demonstration mentioned by Mr. Witherspoon. The desirability of working with existing technological systems and firms was also underlined. Some participants were concerned, however, that this would result in government exerting an undue influence on the development of telecommunications technologies by private industry. Other participants believed that such a governmental role is acceptable (1) if the political process determines that the policy decisions are of benefit to the public welfare, and (2) if the government can eventually terminate its role, leaving the question of long-range allocation of resources to the market and to society generally. In any event, the participants stressed that private industry will not be left out of the process of technological choice because it has inputs into government thinking through the processes which government follows in letting contracts.

One participant suggested that we now have a fairly good idea of what criteria are needed for telecommunications demonstration projects to succeed, and he asked whether it would be possible for OMB or Congress to develop a checklist of those criteria and to require that agencies apply them to future projects. Similar requirements have been imposed in the environmental area, and Senator Moss has introduced a bill in the materials-research area that mandates market analysis and examination of technological alternatives. Some participants thought that a government check list of this sort would be feasible and worthwhile. Others cautioned that because the area of telecommunications applications is so new and uncertain, it would be unwise and possibly destructive to pin down specific requirements at this point.

Despite the many problems discussed at the meeting and the difficulties of finding solutions, many participants were optimistic about telecommunications applications to social services. One speaker pointed out that there is too much impatience for *major* advances in this area. Another observed that if only 10 percent of research and development in social service applications resulted in on-going systems, this would be an extremely successful record by industrial standards.

Several participants noted that although demonstration projects in the telecommunications field often do not reach their specified objectives, they may have indirect effects that are of great value. For example, because the ATS-6 experiments shook up parts of the health care system of India, they resulted in some significant improvements in services not directly tied to telecommunications. Similarly, in the Dade County, Florida, health care experiments, it was found that nursing homes using telecommunications improved their effectiveness considerably in ways unrelated to the narrowly defined goals of the experiment. Finally, the Appalachian

applications of ATS-6 created benefits which could not have been achieved otherwise, such as the coordination of textbook and curriculum planning among eight state educational authorities.

While the seminar participants did not believe that government should invest sizable sums in public service applications of communications technologies merely in the vague hope of useful side effects, they stressed that research on these applications is still in the exploratory phase, and that unexpected benefits should be weighed in the balance when trying to determine future directions. In addition, the participants pointed out that the few clearly successful communications projects should not be ignored. They cited, for example, the experience of the rural cooperative in Trempealeau County, Wisconsin, where cable television for rural residents may be possible through the imaginative integration of educational applications.

A principal theme running through the meeting was that the issues raised in regard to social applications of communications technologies are too little discussed, especially among non-federal decision makers. Many participants suggested the need for more advocates of change and for more public information, especially through the communications media themselves.

# Appendix:

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*Addresses listed are current as of October 1976.*

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